MSV
Mobile Satellite Ventures LP

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EX PARTE OR LATE FILED

January 13, 2006

Via Hand Delivery
Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Mobile Satellite Ventures LP
***Ex Parte* Presentation**
File Numbers Attached as Exhibit A

Dear Ms. Dortch:

On January 11 and 12, 2006, Jennifer A. Manner, Vice President, Regulatory Affairs of Mobile Satellite Ventures LP ("MSV"); Thomas M. Walsh of Boeing Satellite Systems, Inc.; and Bruce D. Jacobs of Pillsbury Winthrop Shaw Pittman LLP, counsel for MSV; met with (i) Fred Campbell, Legal Advisor, and Emily Willeford, Advisor and Deputy Chief of Staff, for Chairman Kevin J. Martin; (ii) John Giusti, Legal Advisor for Commissioner Michael J. Copps; (iii) Barry Ohlson, Senior Legal Advisor for Commissioner Jonathan S. Adelstein; and (iv) Aaron Goldberger, Legal Advisor for Commissioner Deborah Taylor Tate.

MSV and Boeing discussed their recently announced contract for the construction and delivery of three next generation, transparency class, high-powered L band satellites to serve the Western Hemisphere, which will be among the largest and most powerful commercial satellites ever built. They also discussed the need to complete coordination of the Inmarsat 4F2 satellite to avoid harmful interference to MSV's L band operations and the importance of addressing the loaned spectrum issue in the context of any action on the pending applications regarding use of the Inmarsat 4F2 satellite.

In addition, MSV provided Mr. Goldberger with copies of the attached primer on MSV's development of an Ancillary Terrestrial Component ("ATC") as well as the White Paper entitled "Toward a Next Generation Strategy: Learning from Katrina and Taking Advantage of New Technologies" that MSV submitted on November 10, 2005 in WT Docket No. 05-157.[1]

[1] *See* Letter from Jennifer A. Manner, MSV, to Marlene H. Dortch, FCC, WT Docket No. 05-157 (November 10, 2005).

Please contact the undersigned with any questions.

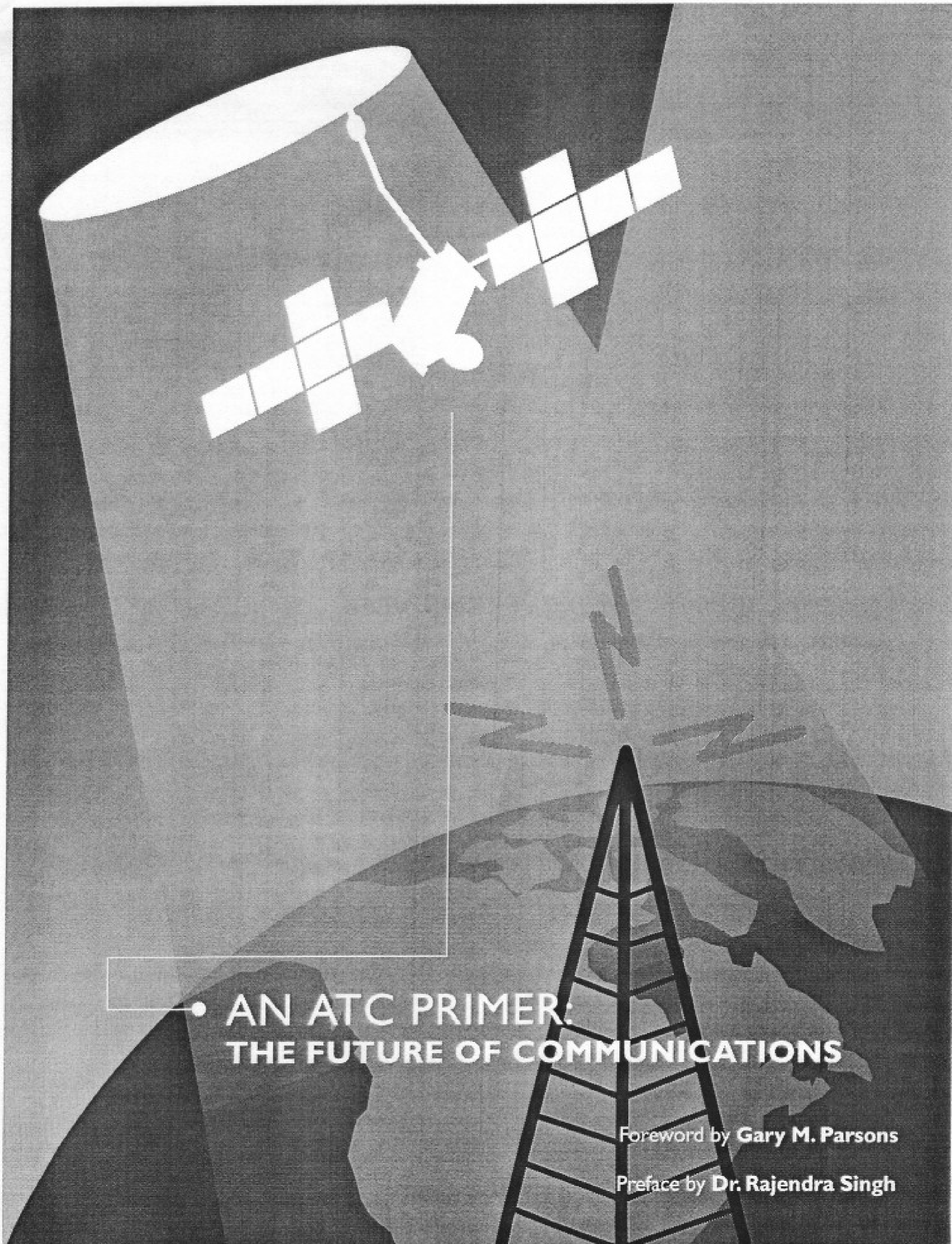
Very truly yours,

Jennifer A. Manner

cc: Fred Campbell
Emily Willeford
John Giusti
Barry Ohlson
Aaron Goldberger

Exhibit A

Applicant	File Number
Stratos Communications Inc.	SES-LFS-20050826-01175 (Call Sign E050249) SES-AMD-20050922-01313 (Call Sign E050249) SES-MFS-20051122-01614 (Call Sign E000180) SES-MFS-20051122-01615 (Call Sign E010050) SES-MFS-20051122-01616 (Call Sign E010048) SES-MFS-20051122-01617 (Call Sign E010049) SES-MFS-20051122-01618 (Call Sign E010047) SES-STA-20051216-01760 (Call Sign E000180) SES-STA-20051216-01761 (Call Sign E010047) SES-STA-20051216-01762 (Call Sign E010048) SES-STA-20051216-01763 (Call Sign E010049) SES-STA-20051216-01764 (Call Sign E010050)
Telenor Satellite, Inc.	SES-LFS-20050930-01352 (Call Sign E050276) SES-AMD-20051111-01564 (Call Sign E050276) SES-MFS-20051123-01626 (Call Sign KA312) SES-MFS-20051123-01627 (Call Sign KA313) SES-MFS-20051123-01629 (Call Sign WA28) SES-MFS-20051123-01630 (Call Sign WB36) SES-STA-20051216-01756 (Call Sign KA312) SES-STA-20051216-01757 (Call Sign WB36) SES-STA-20051216-01758 (Call Sign WA28) SES-STA-20051216-01759 (Call Sign KA313)
FTMSC US, LLC	SES-LFS-20051011-01396 (Call Sign E050284) SES-AMD-20051118-01602 (Call Sign E050284)
SkyWave Mobile Communications Corp.	SES-MFS-20051207-01709 (Call Sign E030055) SES-STA-20051222-01788 (Call Sign E030055)
MVS USA, Inc.	SES-LFS-20051123-01634 (Call Sign E050348)
Satamatics, Inc.	SES-MFS-20051202-01665 (Call Sign E020074) SES-STA-20051223-01790 (Call Sign E020074)



AN ATC PRIMER:
THE FUTURE OF COMMUNICATIONS

Foreword by **Gary M. Parsons**

Preface by **Dr. Rajendra Singh**

AN ATC PRIMER:
THE FUTURE OF COMMUNICATIONS

FOREWORD

By: Gary M. Parsons[1]

In business, as well as in life, most forward progress occurs through some combination of opportunity, necessity, creativity and perseverance. When dealing with technical issues, however, creativity/vision and perseverance are not sufficient catalysts, and the timing of a breakthrough is normally dictated by ongoing advancements in technology. Such is the case with the emergence of integrated, or hybrid satellite-terrestrial networks.

Hybrid satellite-terrestrial networks seamlessly blend the most powerful aspects of each technology. Satellites historically have provided the best and most comprehensive coverage of low-density populations across large land masses while terrestrial facilities have provided the highest bandwidth, lowest cost coverage of high-density populations in urban environments. Hybrid networks utilize common spectrum devices to provide a user experience which utilizes the power and cost efficiency of terrestrial networks where they are available and the ubiquity and disaster-tolerance of satellite networks when necessitated.

I have been fortunate to be associated with two premier examples of hybrid networks during the past decade. XM Satellite Radio uses terrestrial repeaters to boost the satellite broadcast signal in dense urban areas, thus providing a high quality, low cost digital radio signal. The XM Radio service has been enthusiastically adopted by millions of consumers in one of the fastest growing consumer entertainment services ever introduced. Terrestrial augmentation of the satellite signal was essential in ensuring a true mass market product which attracted the participation of automobile manufacturers, consumer electronics giants, and powerful media programming and content. The value and attractiveness of the product would not have been the same with either a satellite-only or terrestrial-only network.

Mobile Satellite Ventures carries hybrid networks to the next logical stage with the integration of terrestrial and satellite components to provide high-speed, two-way voice and data services. Technologically, the nesting of terrestrial base station cell sites inside of much larger geography satellite cells allows for multiple frequency reuse and provides not only the seamless user experience of hybrid networks, but also the true public interest benefits of reusing spectrum for its highest and best use on a non-interfering basis. The seamless ability of user terminals (or handsets) to move between the terrestrial and satellite components provide for a superior consumer experience in daily use, while providing public safety, first responders and emergency preparedness agencies an essential and interoperable communication system in time of national emergency.

Both at XM Satellite Radio and at Mobile Satellite Ventures, progress has been made by equal parts of opportunity, necessity, vision and perseverance, facilitated by significant advancements in technology and intellectual property. While honored to have played some part in the vision and perseverance elements, I am deeply grateful to the superior technology minds who have truly made this progress possible. Dr. Stelios Patsiokas and Paul Marko at XM Satellite Radio, and Dr. Rajendra Singh, Dr. Peter D. Karabinis and Dr. Santanu Dutta at Mobile Satellite Ventures. I also gratefully acknowledge the positive role that enlightened regulatory authorities played in

[1] Mr. Parsons has spent over 30 years in the telecommunications industry in a number of technical and executive roles. He currently serves as Chairman of the Board of Mobile Satellite Ventures and XM Satellite Radio, and was instrumental in the founding and development of both companies.

recognizing the public interest and value of hybrid network technology, and establishing flexible rules and licenses allowing these new technologies to reach the American public.

This Primer provides an examination of the technical, business, regulatory and legal landscape of hybrid satellite/terrestrial systems, most particularly the Ancillary Terrestrial Network augmentation of mobile satellite systems as manifested by Mobile Satellite Ventures. It also provides a summary of some of the intellectual property requirements for such a system. I hope you find the analysis to be both visionary and thought provoking.

Gary M. Parsons
November, 2005

PREFACE

By: Dr. Rajendra Singh[2]

Mobile Satellite Ventures' ("MSV") ground-breaking research and investments into emerging hybrid satellite-terrestrial wireless networks have paved the way for hybrid mobile satellite systems ("MSS") to provide a truly ubiquitous communications solution for all needs. For public safety organizations and rescue organizations this kind of system is ideal, allowing communication with normal telephones and providing internet connections anywhere on the continent. As stated recently by former FCC chairman Reed F. Hundt regarding emergency communication capacity in the aftermath of Hurricane Katrina: "[W]e always discover the same thing. We need a national emergency communications network and we don't have one." MSV is intent on changing that.

MSV's hybrid architecture will be uniquely positioned to address the needs of public safety, while at the same time providing affordable communication to the public in the remotest areas of our country. Further, as the industry moves toward broadband wireless services, there exists a scarcity of spectrum resources that can support nationwide, broadband wireless networks.

There have been many mobile wireless advances during my twenty-five year career launching new ventures, but few, if any, are as remarkable as MSV's. MSV's team of telecom veterans have drawn on their years as leaders in the communications field to invent a system that can be made to provide satellite/terrestrial mobile terminals with a form factor and cost that is virtually indistinguishable from today's cellular phones, but which can switch seamlessly between the system's space-based and terrestrial network components.

In accordance with this new hybrid system, space-based components and terrestrial components work seamlessly together to provide unprecedented ubiquitous coverage and spectral efficiency using a common set of MSS link frequencies. Users' mobile terminals will operate in the "traditional" cellular terrestrial fashion when terrestrial service is available. Those same terminals, however, will seamlessly switch to satellite mode when terrestrial service is down (for example, in the case of Hurricane Katrina) or otherwise unavailable (for example, out-of-range).

The system uses advanced frequency reuse and interference cancellation techniques, for which MSV has submitted numerous patent filings. Some patents have already been awarded with granted claims exceeding several hundred. The frequency reuse techniques conceived by MSV are designed to dynamically provide optimum spectrum sharing between the satellite and terrestrial links as operating conditions warrant. MSV also leverages advanced adaptive antenna array processing through ground-based beam forming in the satellite network. This reduces interference between the terrestrial and satellite components of the hybrid network, thereby increasing the overall spectral efficiency of the network. Through the use of advanced mobility management techniques, MSV's hybrid network can achieve a degree of seamless interoperability not seen in previous MSS, some of which have offered loosely coupled inter-working with terrestrial public land mobile networks.

MSV has invested many years and significant capital in developing its state-of-the-art hybrid communications network. MSV has envisioned the positive, designed around the negative, patented many important aspects of the hybrid network design and now stands on the threshold of defining and offering an advanced, feature rich, user-friendly hybrid satellite-terrestrial next generation cellular communications system for both traditional and new kinds of public communications needs. The resulting hybrid network can provide all the ingredients necessary to add a whole new dimension to cellular communications for the 21st Century.

Dr. Rajendra Singh
November, 2005

[2] Dr. Singh is the Chairman, Chief Executive Officer and principal owner of Telcom Ventures, a private investment firm specializing in telecommunications and related information technologies, which has launched numerous wireless and other telephony communication systems throughout the world. Dr. Singh received his Doctorate in Electrical Engineering and is a distinguished telecommunications expert and renowned inventor.

I. ATC: AN OVERVIEW

In its groundbreaking application to the Federal Communication Commission ("FCC") in 2001, Mobile Satellite Ventures LP ("MSV"), unveiled a bold new architecture for a MSS with an Ancillary Terrestrial Component ("ATC") providing unparalleled coverage and spectral efficiency. As set forth in the application, the users of the system could transmit and receive information from virtually everywhere using "lightweight, handheld mobile terminals" that could communicate through both a space segment and terrestrial facilities using the same frequencies of a satellite band.[3] The application received much opposition from incumbent organizations, but it prevailed.[4]

Following a lengthy debate, the FCC concluded that it would be in the public interest to authorize MSS operators to use ATC to expand and improve the reliability of MSS services in populous areas. The FCC granted MSV the "first ever" ATC license, a license to "enable MSV to offer high-quality, affordable mobile services to users inside buildings and in urban areas, in addition to providing MSS in rural areas."[5] The FCC concluded that MSV's vision of ATC:

> would increase network capacity and efficiency of spectrum use, extend coverage for handset operation in places where MSS operators have previously been unable to offer reliable service, make possible substantial economies of scale, improve emergency communications, and enhance competition.[6]

The FCC decision thus paved the way for new ATC-enabled broadband wireless networks, to be deployed quickly, spectrum efficiently and cost-effectively using available MSS spectrum.

The concept of ATC has several primary motivations. First, ATC permits seamless availability of service throughout the geography of a region, substantially enhancing the value proposition to the consumer. Second, given the extensive subscriber base that would be serviced by the terrestrial wireless network (i.e. the ATC), devices for the hybrid MSS/ATC network can be procured from mainstream wireless vendors using standard, 3G or 4G, configurations. This creates substantial scale for the equipment and allows ATC operators to offer the same low cost devices as other terrestrial-only wireless operators and in turn attracts more subscribers to the network. Finally, ATC ensures that valuable, low-frequency spectrum (such as L-band MSS spectrum) is utilized as efficiently as possible by allowing reuse terrestrially of the same spectrum operating over the satellite.

As the industry moves toward broadband wireless services, there are scarce spectrum resources that can support nationwide, broadband wireless networks. The FCC has proposed several spectrum blocks for auction to address broadband demand, but costly and lengthy clearing and transition requirements for incumbent users in these bands will delay availability for four to five years, thus limiting current options.

The MSS bands, enhanced with the technological advancements of ATC, provide fertile grounds for expanded broadband services. The MSS bands have preserved worldwide access for critical mobile communications needs, with sufficient contiguous

[3] See "Application for Assignment of Licenses and for authority to Launch and Operate a Next-Generation Mobile Satellite Service system," filing to the FCC, filed by Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC, January 16, 2001.

[4] See FCC IB Docket No. 01-185 Record

[5] See FCC "Order and Authorization," in the matter of Mobile Satellite Ventures Subsidiary LLC, November 8, 2004, p. 1.

[6] Flexibility for Delivery of Communications by Mobile Satellite Services Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, *Report and Order and Notice of Proposed Rulemaking*, IB Docket Nos. 01-185 and 02-364, 18 FCC Rcd 1962 (2003), petitions for reconsideration pending (*"ATC Report and Order"*, modified sua sponte by Order on Reconsideration, 18 FCC Rcd 13590 (2003), ¶ 2, 20-45, 210-11.

spectrum suitable for broadband services. The FCC's decision – allowing MSS operators to deploy ancillary terrestrial networks – opens up the use of MSS spectrum for broadband services through the technological overlay of ATC.

This document is a primer on ATC. This section provides an overview and Section II describes the technologies that have been brought together to make ATC a reality, using MSV's approach as the basis for the illustration. Section III focuses on the intellectual property that has been created by MSV, to enable and protect its hybrid satellite-terrestrial network.

A. Basic Principles of MSS/ATC Hybrid Networks

A hybrid satellite-terrestrial wireless network ("MSS/ATC hybrid network") comprises one or more multi-spot beam satellites ("space segment") and a nation-wide ensemble of terrestrial cell sites (an "Ancillary Terrestrial Component" or ATC) wherein both the ATC and the space segment communicate with user equipment using a common set of MSS frequencies. The space segment has sufficient power (antenna gain) to establish communications with user devices that are indistinguishable from modern cellular/PCS user equipment. Large space segment antennas, providing large antenna gain, and a large number of spot beams, are the key for enabling increased spectrum reuse and communications via low-cost and aesthetically attractive equipment. More sophisticated functions permit the user experience — moving from satellite to terrestrial operation — to be seamless and similar to traditional terrestrial cell-to-cell operation. MSS/ATC hybrid network technology thereby achieves a critical network property which is termed *transparency*. Transparency means that a given communications service, such as voice or packet-switched data, can be supported by the same user device in both terrestrial and satellite modes in a manner that is transparent to the end user. Transparency allows the same service to be provided with the same end-user device, regardless of transmission mode. Transparent ATC devices provide terrestrial and satellite connectivity through units that are indistinguishable in cost, aesthetics, and talk time to standard terrestrial-only cell phones.

Achieving transparency is crucial to the success of any hybrid network offering, because transparency enables the operator to leverage the economies of scale derived by other wireless network operators globally. Unlike the current MSS industry, wherein satellite terminals are based on different technologies and bulkier configurations than standard wireless units, the terminal equipment of a transparent ATC-enhanced MSS network (i.e. a transparent MSS/ATC hybrid network) utilizes the same components as are embedded in standard wireless devices. Further, with integrated ATC services designed to serve tens of millions of users (in marked contrast to standalone MSS niche offerings serving only thousands of users) ATC targets the mass consumer market. This, in turn, drives economies of scale in chipset and device manufacturing for the MSS/ATC hybrid network.

Historically, MSS-only networks have not been able to achieve transparency for two key reasons:

- Space segments lacked sufficient power ("AEIRP") and receiver sensitivity ("G/T") to enable communications with small cellular-like equipment. Both of these parameters are dependent on the satellite antenna gain, which in turn depends on the physical size of the reflector used in the antenna; and

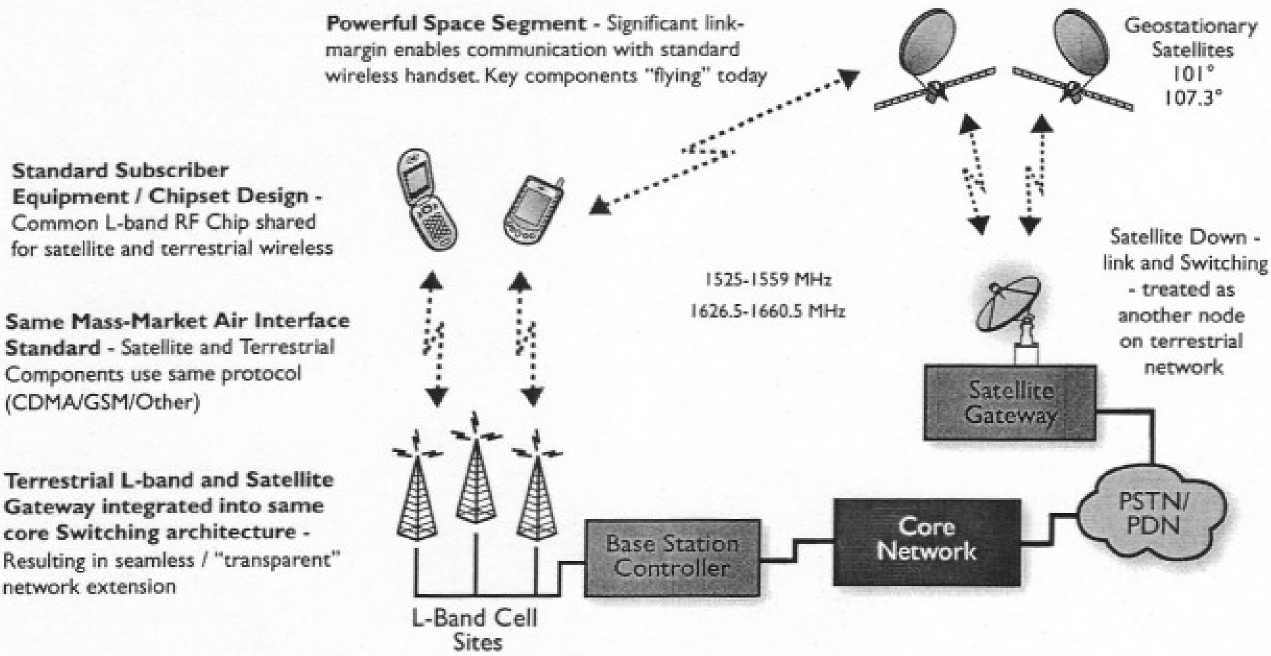
- Satellite air interfaces (protocols) were proprietary and not closely related to mainstream cellular air interfaces. This required user equipment with two radios in one package (the so-called "sandwich" phone) in order to support both a satellite and terrestrial modes, increasing both the bulk and cost of the product.

[7] AEIRP stands for Aggregate Equivalent Isotropic Radiated Power, and is a measure of the amount of power radiated across a coverage area relative to what would have been radiated from a single point source equally in all directions.

As illustrated in Figure 1, next-generation MSS/ATC hybrid networks address both of these shortcomings. First, such networks will use a very powerful, spectrally efficient satellite system, with large antennas. This ensures that the space segment appears to subscribers' equipment as virtually another standard base station in the sky. Second, next-generation networks will support the same mainstream terrestrial air interface standards (CDMA2000, GSM, 802.16, 802.20, W-CDMA, WiMAX and others) over both the terrestrial and satellite networks. Together, these two features enable the use of user equipment that is virtually indistinguishable from that available in the terrestrial wireless markets. The network operators can thereby take advantage of the economies of scale and aesthetics of standard cellular devices.[a]

Less innovative networks will not be able to address the historical shortcomings that have plagued the MSS industry because of a lack of one or more of these features. These networks will, therefore, be unable to deliver transparency to the end user, and will not be able to take advantage of the economies of scale made possible by transparency.

Figure 1 – Hybrid Terrestrial/Satellite Wireless Network



[a] Because the satellite system will operate as another node in a terrestrial network and will use the same air interface as the terrestrial network, the special needs of satellite transport relative to terrestrial transport can be accommodated with minor modifications to the selected terrestrial air interface in a manner that has a minimal cost impact and no aesthetic impact to the user device.

B. Key Benefits of ATC Networks

In January 2003, the FCC acknowledged the benefits that an MSS/ATC hybrid network can bring, noting that:

> [P]ermitting MSS ATC in the manner prescribed in the Order should: (1) increase the efficiency of spectrum use through MSS network integration and terrestrial reuse and permit better coverage in areas that MSS providers could not otherwise serve; (2) provide additional communications that may enhance public protection; and (3) provide new services in the markets served by MSS.[9]

Transparent MSS/ATC hybrid networks offer each of these features with added benefits, including the following:

- A truly ubiquitous communications service with transparent devices
- Network scalability driving dramatically reduced equipment pricing
- Spectrum efficiency
- Platform for innovative and differentiated service offerings

1. *Ubiquitous Coverage*

As noted, satellites can now be built that are powerful enough to enable subscribers to use wireless devices that are virtually identical to current PCS/cellular devices in terms of aesthetics, cost, form factor, and functionality. The terrestrial and satellite components of the hybrid network provide complementary coverage. The terrestrial component ensures service availability in major urban areas, where satellite-only systems suffer blockage from buildings. Likewise, the satellite component provides coverage to those areas that are impractical or uneconomical to serve terrestrially. The ubiquitous coverage enabled by hybrid networks substantially enhances the value proposition for safety and security applications in a variety of wireless segments, most importantly among public safety, consumer telematics, and fleet management. Such coverage also permits a "Total Coverage" wireless offering, whereby mass-market wireless users can rely on connectivity to be available over all of North America.

2. *Network Scalability*

Next-generation hybrid MSS/ATC networks are fundamentally different from prior satellite-only networks and will overcome challenges faced by earlier MSS systems. This is because in addition to providing urban coverage, the terrestrial component ensures scalability. The overall system can thereby accommodate the traffic volume of national U.S. wireless operations (tens of millions of users) in contrast with the volume levels handled by satellite-only systems (tens of thousands of users). The large number of users ensures access to top tier manufacturers of mass-market wireless products and chipsets at costs similar to those borne by other terrestrial-only wireless operators. This leverages the scale of worldwide handset and device development, with a scale in the hundreds of millions, and the commensurate savings in device pricing of five to ten times less than comparable MSS-only device pricing. The expansive user base also drives economies of scale in network utilization that in turn supports service pricing that is in-line with conventional terrestrial-only pricing.

MSS operators without ATC networks are not able to establish the scale necessary to attract top tier manufacturers to produce user equipment at low cost. Similarly, hybrid networks that are being contemplated without providing transparency will not be able to offer aesthetically appealing low-cost user devices, will not benefit from the opportunity to leverage worldwide scale, and will not be able to attract substantial volumes of users. As a result, these types of networks will not be able to support the device and service pricing enabled by advanced transparent MSS/ATC hybrid networks.

[9] FCC News Release, "Flexibility Granted for Mobile Satellite Services", January 30, 2003.

3. *Spectrum Efficiency*

Next-generation MSS/ATC hybrid networks will dramatically improve spectral efficiency. Figure 2 depicts MSV's patented approach to spectrum reuse between the satellite and terrestrial portions of such a system. In effect, terrestrial cells are nested inside satellite cells ("satellite spot beams"), as the satellite cells are much larger in diameter (i.e. more than one hundred kilometers in diameter), whereas at L-band frequencies, ATC cell diameters can range from about one kilometer in dense urban environments, to about five kilometers in suburban areas, depending on subscriber density and network utilization.

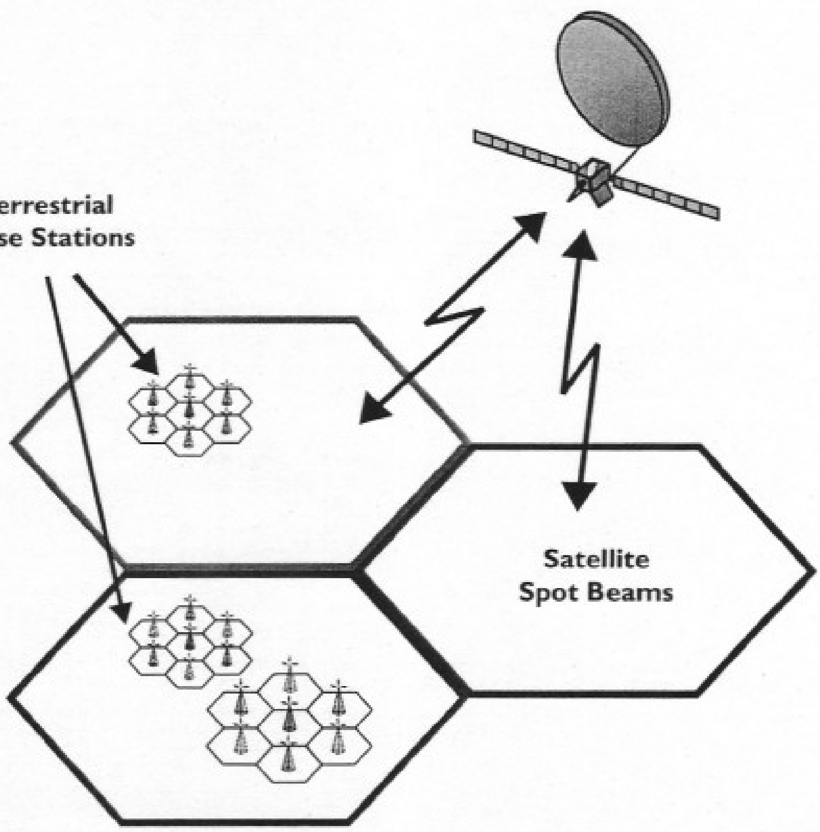
An MSS/ATC network creates the opportunity to use MSV's spectrum for a substantially broader, nationwide business plan, one that permits terrestrial wireless deployments that are similar or superior to those of other 3G wireless operators. By deploying thousands of cell sites and two or more satellites to work jointly in a common nationwide wireless network, MSV's approach maximizes spectral efficiency.

MSV, in collaboration with leaders in terrestrial network design, has developed innovative network management techniques to allow mobile phones to seamlessly transition (bidirectionally) between terrestrial and satellite modes, through adaptations of existing techniques used in cellular/PCS systems for mobile-assisted cell-to-cell handoff. Such techniques ensure seamless and transparent system interoperability over the entirety of the hybrid infrastructure.

4. *Platform for Broadband Wireless Access*

A number of recent wireless service developments and trends strengthen the appeal of transparent MSS/ATC hybrid networks.

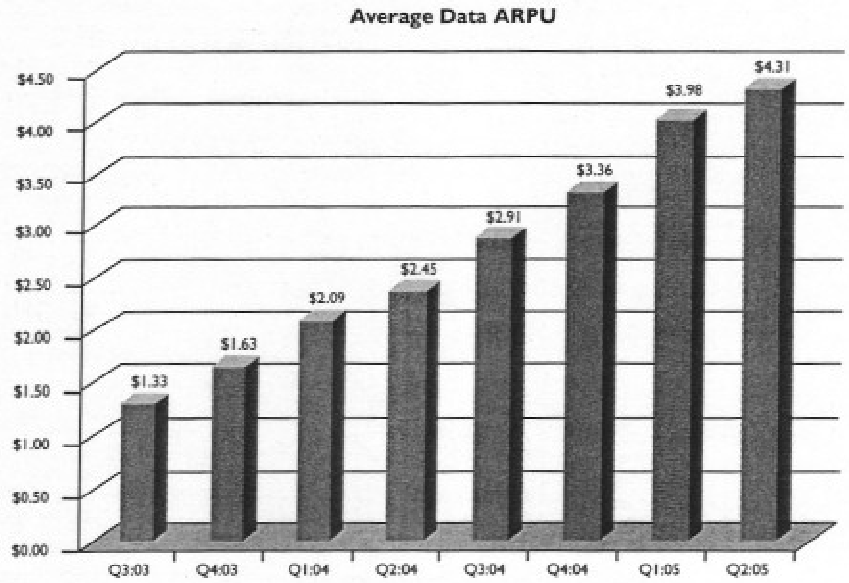
Figure 2 – Satellite Spot Beams Allow Frequencies to be Reused by Terrestrial Base Stations

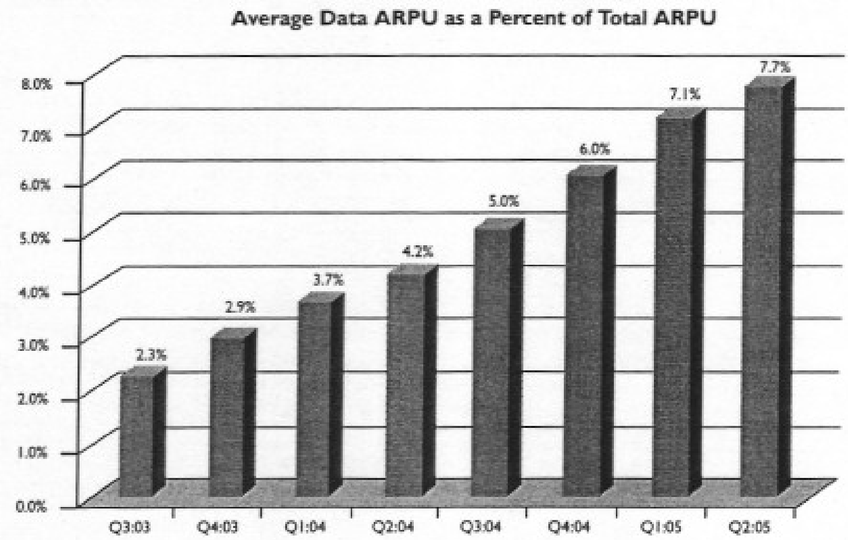


Growth of Data Services

There has been substantial, robust growth in demand for wireless data services in the United States during the last two years. In recent quarters, average data ARPU for the national wireless operators has climbed from 2.3% of total ARPU (3rd quarter of 2003) to 5.0% of total ARPU (2nd quarter of 2005)[10]. Sprint PCS has been particularly successful with its wireless data offering, growing per subscriber data ARPU from $0.14 to over $5.07 since 2002 (8% of total ARPU)[11].

Figure 3 – Increasing Data Contribution for National Wireless Carriers





Source: SG Cowen & Co.

[10] SG Cowen & Co., "Telecom Services", October 6, 2005.

[11] SG Cowen & Co., "Telecom Services", January 5, 2005.

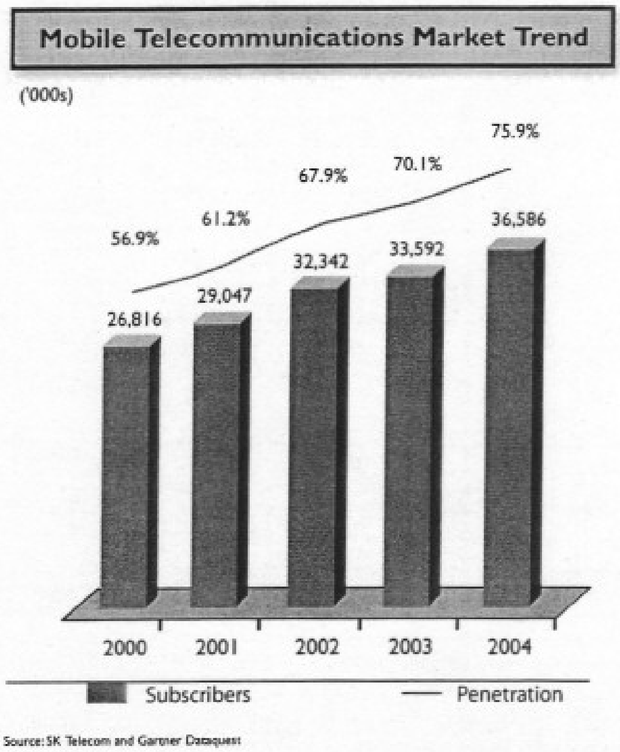
International trends are similar but at substantially higher usage levels. For example, in Asia, Korea continues to experience significant growth in the mobile data market. SK Telecom has been effective at capturing this market and data ARPU ($9.31) now represents over 22% of total ARPU ($40.98). Although data growth in Japan is flat because the market has matured, data ARPU continues to comprise a significant portion of total ARPU. For NTT DoCoMo, data ARPU ($16.45) exceeds 26% of total ARPU ($62.74)[12].

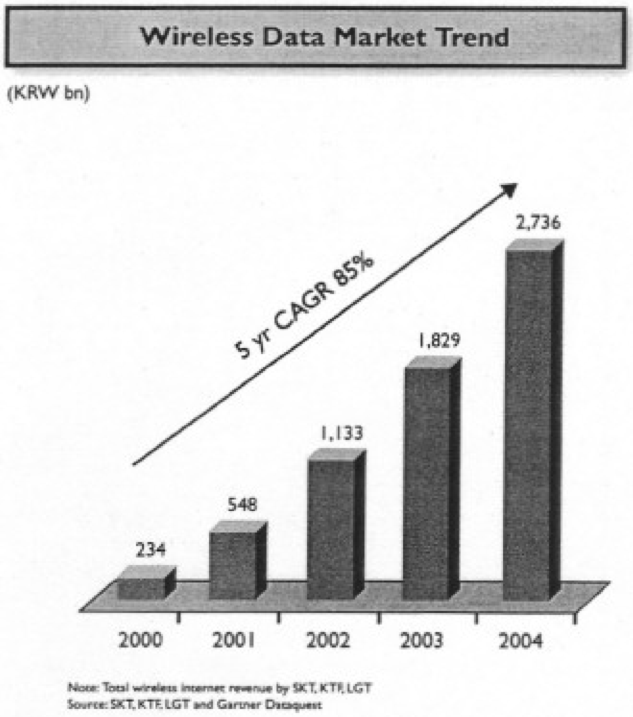
Wireless Air Interfaces

The emergence of advanced air interfaces (802.16, 802.20, W-CDMA 1X-EVDO, etc.) – capable of providing high-speed broadband services, music and video downloads, broadcast content services, and mobile gaming – promises to strengthen and accelerate consumer demand for mobile broadband and content-related services. At the same time, the expansion of content into the mobile space, including video phones with built-in music players, has brought a number of new participants into the telecommunications arena, as video, gaming, and music content developers seek mobile extensions of their distribution channels.

- Major music companies have struck deals with wireless service providers to supply exclusive artist content, including upcoming videos and ring tones.
- Hollywood studios have signed deals with wireless operators in the U.S. and Europe to provide exclusive programming over mobile user devices.

Figure 4 – Korean Mobile Telecommunications Trends





[12] Credit Suisse First Boston, "NTT DoCoMo Company Update", August 8, 2005.

- Qualcomm's subsidiary MediaFLO and Crown Castle's Mobile Media subsidiary plan to deploy and operate a nationwide "media-cast" network, delivering high-quality video and audio programming channels to mobile user devices.

All-IP Open Architecture

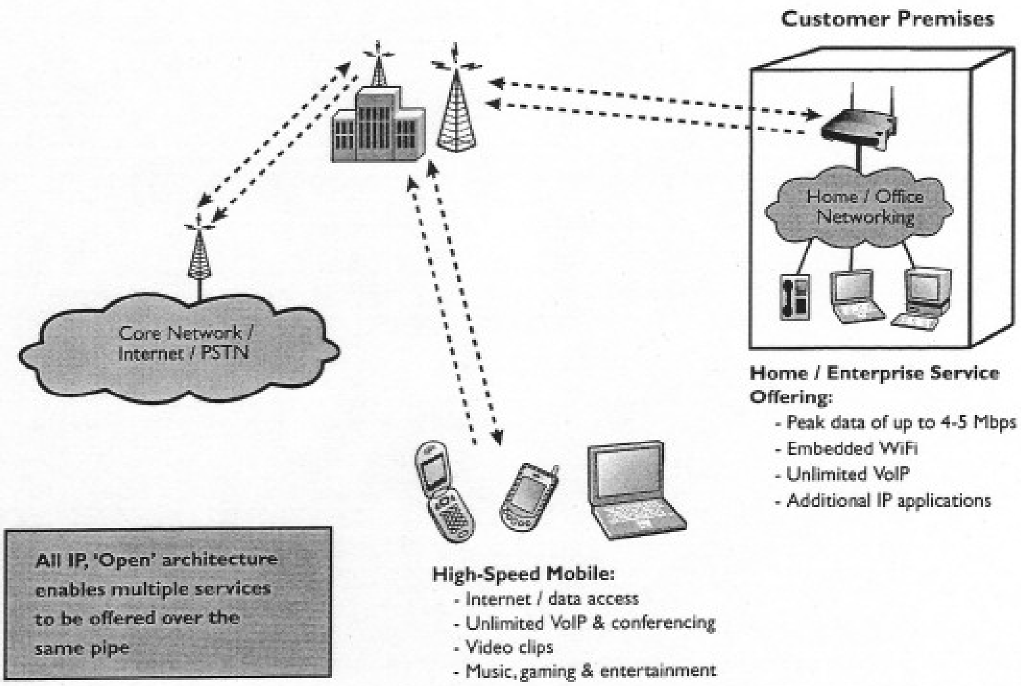
MSS/ATC hybrid networks can capitalize on the recent advances in wireless air interfaces and the growing demand for broadband and content-related services. Transparent MSS/ATC hybrid networks can use MSS spectrum resources to offer broadband wireless services, using a next-generation air interface in conjunction with an all-IP network architecture. The network may provide both fixed broadband wireless services to the home (DSL replacement) and portable/mobile broadband wireless services and content-related applications. The network will also provide users with wireless voice services through VoIP.

An all-IP open architecture, which is supported by MSS/ATC hybrid networks, brings with it significant cost advantages over legacy wireless networks, including savings relative to circuit-switched infrastructure as well as the ability to offer multiple services over a common medium. This will enable service providers to offer a full bundle of telecommunications services at significantly lower rates. In addition, given an all-IP nature and open access, the MSS/ATC hybrid network will resemble the all-IP wireline network, facilitating a much broader set of device suppliers and applications developers.

Broadband Wireless Access

Figure 5 provides an overview of an integrated suite of services and devices, anchored by a home gateway, that next-generation MSS/ATC hybrid networks will be able to offer to households. In accordance with this approach, each home serves as an anchor to consumers' telecommunications needs, equipped with home gateways, powered by an ATC wireless network, providing in-home connectivity. Handsets, PDAs, and laptops, also powered by the ATC network, would expand wireless communications connectivity outside of the home.

Figure 5 – Home/Enterprise Access and Mobility



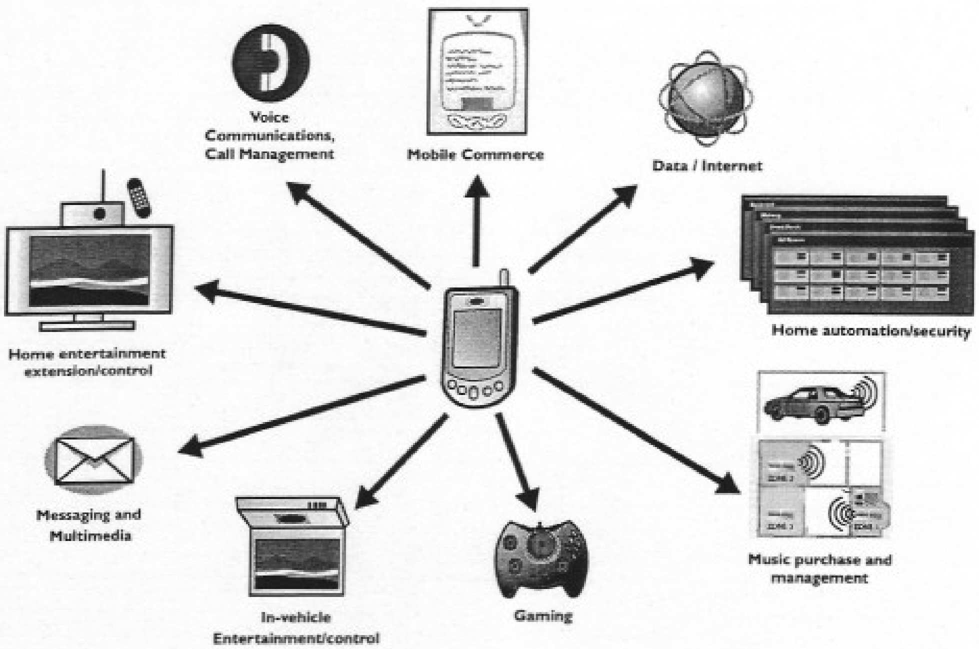
Alternatively, MSS/ATC hybrid networks could be used to provide a purely mobile broadband wireless platform, with the mobile device serving as the gateway to the consumer's telecommunications needs, including voice services, mobile data/internet, and gaming. Figure 6 illustrates the suite of services and applications that such mobile devices might control.

C. ATC Benefits to Vertical Markets

MSS/ATC next-generation hybrid networks will also offer a substantial value proposition to a number of vertical markets, including the following:

- ***Public Safety and Homeland Security*** – provides ubiquitous coverage, system redundancy, interoperability, priority access, push-to-talk and multi-media functionality to public safety personnel and the homeland security community who need these features most.
- ***Consumer Telematics*** – availability of safety and security services over every mile of North American roadways while providing seamless migration to next-generation air interface technologies and improved functionality.
- ***Fleet Management*** – ubiquitous service offering at dramatically reduced equipment and service pricing while providing enhanced functionality (high bandwidth data services and push-to-talk voice capabilities).
- ***Direct Broadcast Satellite (DBS)*** – low-cost L-band transceiver that can be packaged with every DBS dish to permit seamless availability of a return-link for interactive television.
- ***Maritime*** – dramatically reduced equipment and service pricing for voice and data connectivity, and increased coverage for enhanced safety service.
- ***Aeronautical*** – higher bandwidth services at dramatically reduced service pricing for voice and data connectivity, including corporate VPN access and internet browsing.
- ***Rural Market Offering*** – ubiquity enabled by the satellite system enables MSS/ATC hybrid networks to bridge the "digital divide" and provide advanced communications services to rural communities.

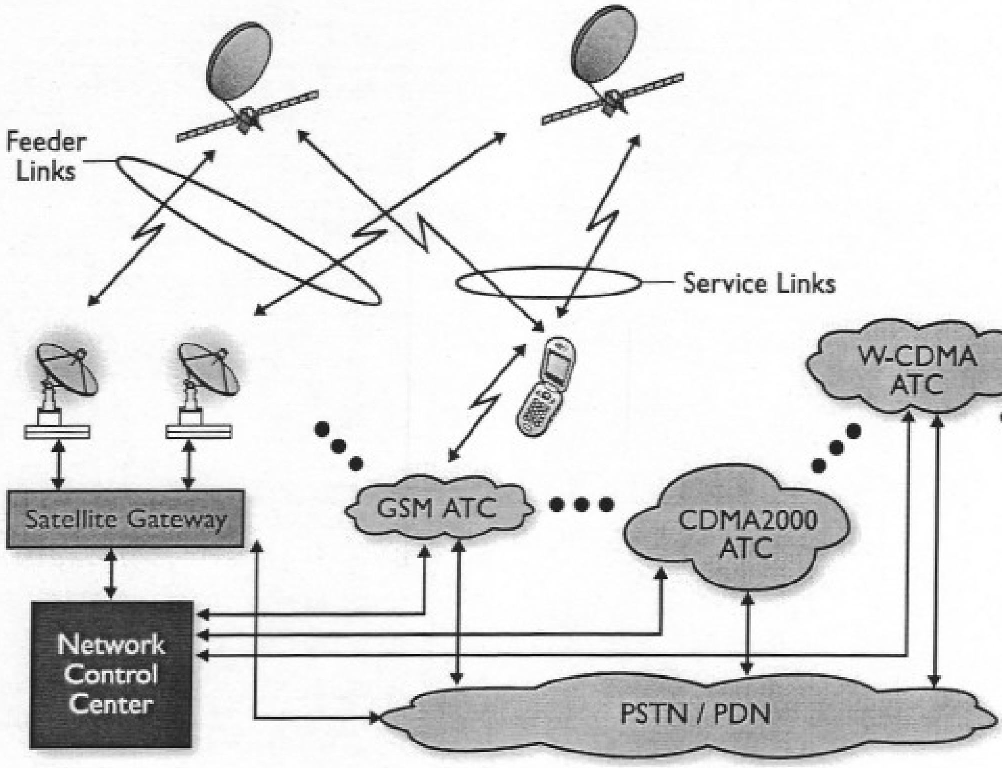
Figure 6 – Handset as Multi-Application Controller



II. SPECIFICS OF THE MOBILE SATELLITE VENTURES MSS/ATC HYBRID SYSTEM ARCHITECTURE: A POTENT SOLUTION

Figure 7 illustrates the architecture of the hybrid MSS/ATC system to be launched by MSV. Each system component is optimized to enhance transparency, maximize ubiquity, and facilitate the most spectrally efficient utilization of available MSS frequencies.

Figure 7 – Hybrid MSS/ATC Network System Architecture



The space segment includes two geostationary satellites for added space segment capacity and communications robustness to small, aesthetically attractive devices. The powerful satellites are designed to transmit signals to, and receive signals from, standard wireless devices that are transparent in form-factor, features and pricing to mass-market state-of-the-art cellular/PCS devices. In order to maximize communications robustness, signals from each transmitting user device are received by each of the two satellites. These signals are transported to the ground (via the satellite feeder links) and are combined at the satellite gateway to significantly increase (at least double) a user's signal. The benefit of this function (return-link satellite diversity combining) is to reduce the output power requirement of wireless user devices, thus increasing battery life, while preserving communications link robustness.

The terrestrial network (i.e. the ATC) conforms to a mass-market air interface standard and functions much like any other standard, terrestrial wireless network, with a few key advancements. It is designed having an all-IP, open architecture. It is servicing a wide range of device types including handsets and PDAs, as well as integrated laptops and home gateways. It has an integrated satellite communications component, visible as another node in the network. The satellite spot beams serve as overlay cells, as illustrated in Figure 8; the terrestrial cells serve as micro and pico cells for the overall network. The end result is one network, with a broad, terrestrial wireless cell site footprint of thousands of sites and with two satellites covering rural and remote territories not covered by the terrestrial network.

Establishing a nationwide wireless broadband network is a priority initiative for virtually all major U.S. telecommunications providers. MSV's vision for using L-band spectrum via its MSS/ATC hybrid network is responsive to the broadband wireless need and creates substantial opportunity for a truly nationwide broadband solution:

- Video service providers see the opportunity of providing a combination of three core service types (video, data, voice) to both in-building customers (at home or in the office) and mobile customers. These providers are contemplating the efficiencies derived from a truly integrated "quadruple" play network.

- For those service providers offering end-to-end enterprise connectivity, and paying expensive toll charges for wireline last-mile access, MSV's solution allows bypass of the wireline network with a lower-cost wireless alternative.

- For regional wireline providers, who provide services solely within their home regions, MSV's approach supports network expansion and competition on a nationwide basis, including areas where wireline access is unprofitable.

- MSV may also deploy a carrier's carrier business, backed extensively by a major technology supplier with commitments for equipment and with substantial financing, where MSV would deploy an all-IP open network architecture independently and wholesale the network to the variety of media, telecomm, ISP, and Internet device companies. These providers would then be able to offer their content, devices, and services with integrated wireless connectivity.

MSV's integrated wireless network will be able to support one or more of the above approaches for broadband wireless services in a way impossible to replicate by other MSS companies given MSV's time-to-market lead and patented technology.

MSV's system architecture depicted in Figure 7 assures that the available satellite-band spectrum is optimally "space-time" multiplexed and reused by the space segment and the ATC network while keeping intra-system interference at a minimum. This is accomplished by using patented inter-satellite cell frequency reuse between the space segment and the ATC network, while avoiding intra-satellite cell frequency reuse. For example, an ATC deployed in New York City will not be allowed to reuse the same frequencies used by the satellite cell serving New York City concurrently.

A. System Optimization through MSV Patented Frequency Reuse and Interference Reduction Technologies

As envisioned by MSV, the general concept of frequency reuse in an MSS/ATC hybrid network is illustrated in Figure 8, with different colors indicating different carrier frequencies. Terrestrial cells are, in effect, nested inside satellite cells of much larger diameter. The terrestrial cells inside of a given satellite cell use frequencies not used by the given satellite cell, thus avoiding interference. As a result, all the available frequencies are spatially reused many times over, greatly enhancing system capacity and efficient spectrum utilization. This nesting delivers system capacity, as needed, in high traffic regions (e.g., urban areas). Users within the high traffic areas are serviced by the ATC while users in lower traffic density regions (in unpopulated areas) are serviced by the satellites.

Further, since the satellite system serves a broad geographically diverse range of service areas throughout North America, MSV's system architecture is designed to flexibly adjust and target spectrum utilization to the topographic conditions. In areas of high concentrations of urban development and high density of users (e.g., New York City spot beam), more capacity can be allocated to the ATC network and less to the satellite network. In areas of lower concentrations of population, where terrestrial coverage would likely be sparse, less capacity can be allocated to the ATC network, with the remainder available to the satellite network. The ability to "load balance" the spectrum resource through and between the two components of the hybrid system – the ATC and the satellite segment – is at the very heart of the MSV patented method of hybrid spectrum reuse. This allows for the maximum efficiency in spectrum utilization by the satellite and terrestrial network.

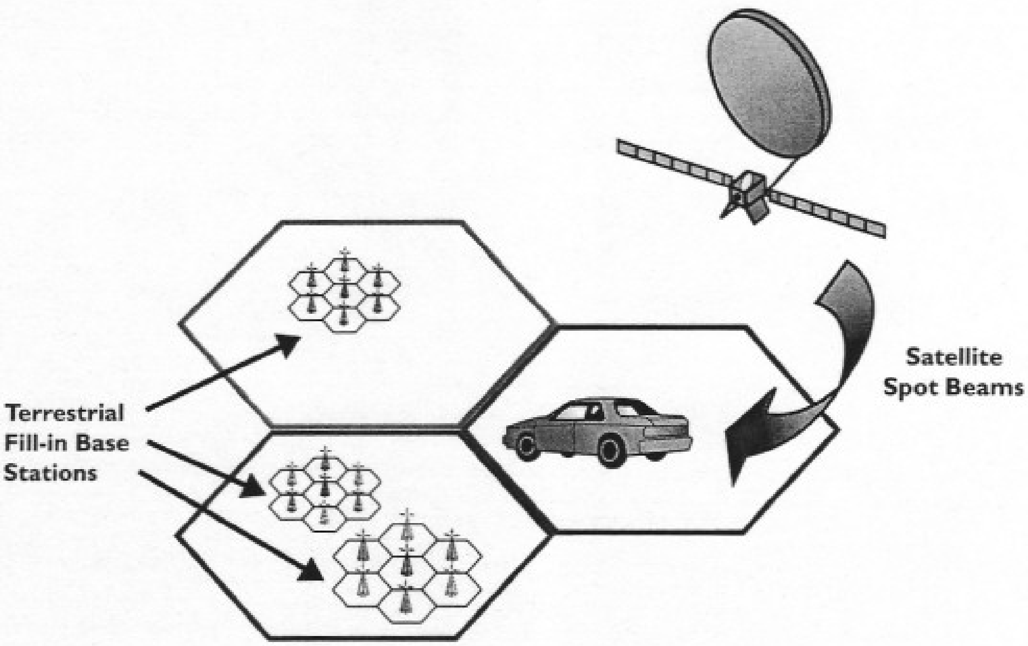
Legacy satellite systems, like Thuraya, Iridium and Globalstar, offer "inter-working" between MSS and terrestrial networks over different frequency bands (satellite and cellular) and without seamless handover. This yields bulkier and more expensive dual-band/dual-mode user devices. The techniques developed and patented by MSV allow the same (MSS) frequency band to be used for both satellite and terrestrial communications seamlessly, yielding simplified single-band/single-mode transparent user devices that are aesthetically and functionally indistinguishable from terrestrial-only, while greatly enhancing the user experience of coverage ubiquity.

In MSV's MSS/ATC hybrid network, users would be able to roam and/or handoff between the terrestrial and satellite sub-networks without the user having any knowledge of the change in the underlying call path. MSV has developed and patented innovative network management techniques to allow user equipment to seamlessly transition from terrestrial to satellite mode, through adaptations of existing techniques used in cellular and PCS systems for mobile-assisted hand-off. Such techniques would ensure seamless and transparent system coverage over the entirety of the hybrid infrastructure.

B. Achieving Transparency through MSV's Patented System Architecture

The technological advancements that enable frequency reuse terrestrially and by satellites are only the first steps in structuring a commercially powerful MSS/ATC hybrid network. In addition to the optimized use of spectrum resources and dynamic capacity allocation capability, MSV's MSS/ATC hybrid network also leverages a plethora of other state-of-the-art technological features, such as Ground-Based Beam Forming of satellite cells (allowing for optimum beam

Figure 8 – Architecture of MSV's Patented Spectrum Reuse



shaping to maximize received signal strength), space and polarization diversity reception by the satellites (further enhancing received signal strength), and ATC-induced interference suppression to further improve the quality of signals received by the satellites. All these technological signal processing advancements (patented by MSV in the context of its hybrid MSS/ATC system architecture) are well within the means of current commercial satellite technologies and are essential elements for completing the transparency ideal.

To complete the transparency ideal, a user device of an MSS/ATC hybrid network must be indistinguishable in every respect from a comparable cellular/PCS-only device and must be able to communicate with the space segment using power levels that are the same as those used to communicate terrestrially with the ATC. Otherwise, the satellite mode will burden the device and transparency will not be satisfied (i.e. the user device will become larger, more expensive, will dissipate more power and will, therefore, be less appealing as a mass-market product).

The Enablers of Transparency

Fundamentally, there are two enablers of transparency. The first relates to the space-based network architecture and signal processing thereof. As previously discussed, the space-based network must include a sufficiently large space-based antenna aperture and optimum signal processing (at the satellite gateway) to maximize the system's available link margin, thus maximizing the strength/utility of communications signals received by the satellites. A space segment having an antenna Gain-to-noise-Temperature ratio ("G/T") of 25 dB/°K,[13] will provide link margin of the order of 10 dB[14] relative to an end-user device whose output power is limited to about one tenth of one Watt. Two satellites at 21 dB/°K G/T each can achieve the robust link margin described above operating in return-link diversity mode with optimum combining of signals at the satellite gateway. Assuming that each satellite can deliver a 21 dB/°K G/T (as can be attained at L-band by a 22 meter antenna aperture), space diversity with optimum combining processing yields the desired 25 dB/°K space segment G/T.

MSV will deploy two geostationary satellites, each with a 22 meter antenna aperture. These satellites will significantly surpass the performance of the best satellites deployed thus far and will, for the first time, create sufficient link margin to ensure that user devices that are no larger or more power-hungry than terrestrial-only wireless devices can communicate with reliability in satellite mode.

Figure 9 and Table 1 summarize the MSV L-band satellite system characteristics. The MSV satellites are large but within the state of the art. MSV's MSAT satellites were the first commercial satellites to use large deployable reflectors. The antennas on these satellites were 5-6 meters across, but since that time antenna technology has improved and larger satellite antennas have been commercially deployed. The Inmarsat I-4's, launched over the past year, have 9 meter reflectors. The Thuraya and ACeS satellites, launched about 8 years ago, have 12 meter reflectors. TerreStar Networks, Inc., is building a satellite with an 18 meter antenna that is intended for launch in 2007 (this satellite will also fulfill transparency requirements as smaller antennas accomplish a similar feat as MSV's next-generation satellites, when deployed at higher frequencies (i.e. at 2 GHz for TerreStar)).

[13] "dB" is a decibel, logarithmic representation of a ratio often used to express gain or loss. "dB/°K" refers to the units in which the sensitivity of a radio receiver is measured ("decibels/degrees Kelvin").

[14] "Link margin" is a measure of power above the absolute minimum needed for a communications link to function.

Figure 9 – MSV Satellite Coverage

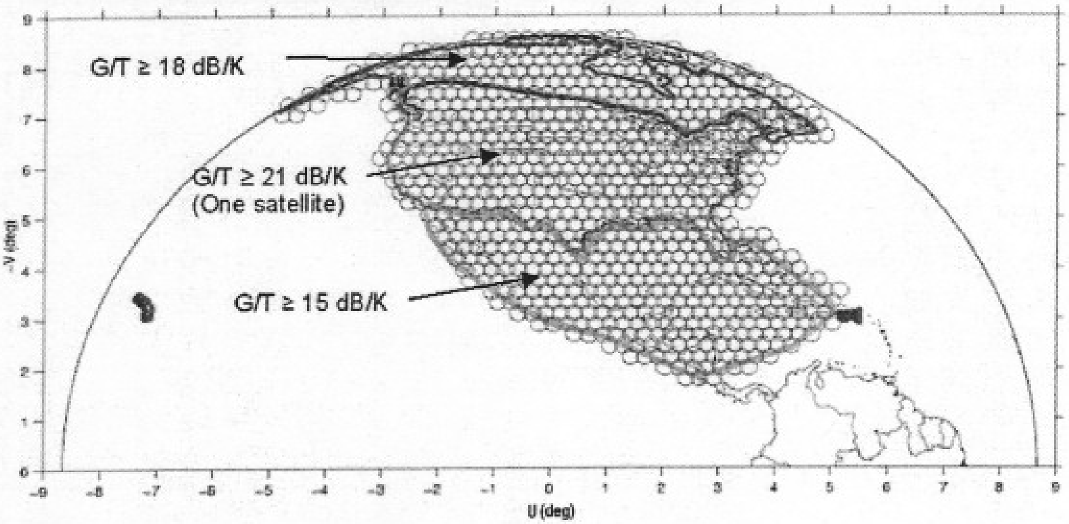


Table 1: MSV Satellite Principal Characteristics

Satellite Orbit Locations	101° W.L. and 107.3° W.L
Service Links	1525-1559 MHz (forward) 1626.5-1660.5 MHz (return)
Feeder Links	12.75 – 13.25 GHz (uplink) 10.75 – 10.95 GHz and 11.20 – 11.45 GHz (downlink)
AEIRP (dBW)	80
G/T (dB/K)	21 or more over primary coverage area
Coverage	See Figure 9
Number of spot beams	Over 500 (0.25°)
Supported protocols	Wideband (3G or 4G)
Processing	Digital channelizer, digital adaptive ground-based beam forming with interference suppression capability, space and polarization diversity reception
Potential vendors	Alcatel, Boeing, EADS/Astrium, Loral, Lockheed
Launch vehicles	Atlas V, Ariane V
Design life	15 yrs inclined

The second enabler of transparency is selecting an appropriate air interface protocol for the satellite links. This simply means that if "X" is the air interface protocol that a user device is using terrestrially (to communicate via the ATC), "Y" must be the satellite-mode air interface protocol, where Y is as similar as possible (if not identical) to X. The adaptation of X to Y may entail, for example, a different vocoder, modifications to signaling channels, and timing changes to the protocol to accommodate the longer propagation delay of the satellite link. The physical layer of the satellite protocol must remain as similar as possible to the terrestrial mode in order to avoid duplication of components. Thus, with substantial commonality in all layers (including the physical) between terrestrial- and satellite-mode protocols, the differences between X and Y shrink and can thus be easily inserted within a common baseband and RF chip-set with negligible impact to the manufacturing cost and form factor of the end-user product.

MSV's ATC network passes the second prong of the transparency test as well. MSV will use a satellite air interface that is substantially identical to a mainstream cellular air interface such as GSM, CDMA2000, W-CDMA, WiMAX or Flash-OFDM. MSV has spent substantial manpower working with key air interface developers, and is jointly developing satellite adaptations of a number of mainstream air interfaces (including CDMA2000 and WiMAX). MSV intends to demonstrate these air interfaces and begin early deployment of its MSS/ATC hybrid network using its existing MSAT satellites. MSV holds technology patents covering various aspects of air interfaces necessary for satellite communications.

III. ATC PATENT STATUS: MSV AS PIONEER AND INDUSTRY LEADER

As an integral part of the process of conceiving, designing, and developing its next-generation MSS/ATC hybrid network, MSV has diligently prepared and filed patent applications reflecting the breadth and depth of MSV's vision. The result is a long and impressive list of patent filings, in the U.S. and abroad, reflecting the diverse and expansive contributions of MSV toward the definition and commercialization of next-generation MSS/ATC hybrid networks. While other MSS operators have been expending energies in favor of legacy systems and/or in opposing MSV, all of MSV's efforts have been single-mindedly focused on inventing the "best of class" for every aspect of a transparent MSS/ATC hybrid system.

MSV's technologists are true pioneers in the communications field with a track record of prolific achievements at some of the world's leading communications companies. Dr. Peter D. Karabinis, MSV's Senior Vice President and Chief Technical Officer, directed satellite systems research and development at Ericsson, and pioneered a GSM-based satellite air interface standard (GMR-2) that is currently in use in the ACeS satellite system. Prior to Ericsson, Dr. Karabinis conducted communications systems research and development at Raytheon Co. and at Bell Laboratories. Dr. Santanu Dutta, MSV's Vice President of Systems Engineering, is a satellite and wireless communications veteran of over 25 years with broad based experience at Ericsson, including standardization of GMR-2, and at Rockwell International in developing the world's first hybrid packet-data network and advanced adaptive antenna array processors. MSV's entire technical staff, as well as the contractors and consultants with whom MSV works, is dedicated to designing and developing the world's preeminent MSS/ATC hybrid system. Their unique combination of skill and experience has resulted in a body of patent filings addressing all of ATC's major technical approaches. The inventive efforts of MSV are captured by seasoned patent attorneys who have prepared comprehensive patent filings that are now on record in patent offices worldwide. MSV is committed to vigorously enforce and defend the rights afforded it through its patents.

The process used to reduce MSV's inventions to patents is extensive, elaborate, and exhaustive. MSV takes a multi-step approach to identifying potential implementations of MSS/ATC and system enhancements/architectures that may be deployed. After filing patents for its inventions, MSV hires additional teams of engineering and patent experts to "reinvent" MSS/ATC. Other teams of experts are retained to attempt to "invent around" MSV's patents. Any additional ideas flowing from these exercises are themselves subject to additional MSV patent filings. MSV has further broadened its intellectual property through the acquisition of the patents of Celsat – the only other sizeable MSS/ATC patent portfolio.

A look inside the MSV MSS/ATC patent portfolio reveals a comprehensive weave of patent filings, in both the U.S. and abroad, expansively covering all aspects/features of MSS/ATC hybrid systems. Some key aspects of MSV's intellectual property are listed below.

1. The ability to achieve transparency through efficient space segment design involving the satellites, satellite air interface, and optimum/adaptive signal processing at the satellite gateway(s);
2. Frequency reuse, allocation, and control in a dynamic and agile manner to achieve maximum spectral efficiencies and reduce interference;
3. The ability to further reduce interference by utilizing satellite beam forming techniques to effect real time beam shaping and load balancing;
4. The ability to configure the MSS and the ATC to function substantially autonomously in order to reduce system complexity and deployment cost; and
5. The ability to seamlessly hand-over communications from ATC to MSS.

An examination of MSV's patent activity in these key areas underscores the significance of MSV's collection of patents to anyone attempting to do ATC.

A. Transparency and Space Segment Design

To date, MSV has amassed dozens of distinct patent filings in the U.S. alone, each of which describes and claims[15] MSV's ability to enhance transparency through its inventive space segment techniques. Each patent filing has multiple claims, typically from 50 to several hundred. With each patent application also being filed in international patent offices worldwide, these patent families contain literally thousands of claims.[16]

MSV's space segment patent filings focus on satellite constellations, including the use of receive-only and transmit-only satellites, as well as the dynamic management of the satellites (discussed further below). The constellations claimed in MSV's patent filings include multi-spot beam satellites, operating in concert with ATC, configured to receive signals from user equipment over multiple satellites and polarizations in order to maximize link robustness. The patents also claim techniques by which users are seamlessly transitioned between MSS communications and ATC communications. Signal processing configurations at the satellite gateway(s) are also claimed, including a combiner to combine communications received from user devices at the various satellites and over the multiple polarizations.

MSV has also claimed its advances in the satellite air interface development, and satellite antenna configurations designed to improve service link performance. The "packing" and "unpacking" of feeder link carriers at the satellite and satellite gateway to minimize feeder link bandwidth requirements is the subject of MSV U.S. Patent 6,937,857. Without this patent, feeder link bandwidth requirements of multi-spot beam satellite systems would be exorbitant. Satellite constellation innovations, including the use of diversity combiners, are also captured in MSV's

[15] The "claims" of a patent define its legal scope. A patent is infringed if any one or more claims of the patent are practiced by an unlicensed party. If a patent is infringed the patent owner may exclude the infringer from making, using, selling, or offering for sale infringing products and services wherever patent protection has been secured.

[16] These patent filings are particularly identified and described further in Annex B, attached.

patent filings and further enrich MSV's unique ability to provide transparency via user equipment that is indistinguishable from cellular/PCS-only user equipment. MSV understands that the ability to provide transparency to the end users of an MSS/ATC network is the key to the network's commercial success. The techniques employed by MSV to achieve such transparency permeate these patent filings.

It is difficult, if not impossible, to imagine the development of a transparent MSS/ATC system architecture that does not practice at least one (if not several) of MSV's patents. From the beginning of its system development, MSV has recognized the commercial necessity of developing a transparent system for the success of an ATC network. As a result, MSV's patent portfolio includes thousands of claims critical to successfully deploying a transparent network.

B. Frequency Reuse, Allocation, Control and Planning for Spectrum Efficiency and Interference Reduction

MSV has filed more than 20 groupings or "families" of patents containing more than 1,300 issued and published patent claims in the areas of frequency reuse, allocation, control, and planning.[17] Interference cancellation or reduction through innovative frequency reuse techniques and signal processing are a cornerstone of MSV's patent portfolio, with claims directed to techniques for band sharing as well as the alternative approach, band segmentation.

Although MSV has focused on protecting optimum frequency reuse techniques, including those relating to interference reduction that further enhance the ability to reuse frequencies between satellite (MSS) and terrestrial cell sites (ATC), MSV has also protected other, less efficient (sub-optimum), frequency utilization techniques between MSS and ATC such as band segmentation.

A few examples of these patent filings and claims will demonstrate the breadth and depth of patent filings in this area. Claims 101 and 213 of MSV U.S. Patent 6,684,057, for example, broadly claim the concept of "modified" satellite band frequencies being used by the ATC to communicate with user equipment.[18]

These two claims address any ATC system that re-uses frequencies of the space segment, which is the most common and desirable method for implementing ATC since it results in the most efficient use of the spectrum. Band segmentation, the other way of implementing ATC, where the MSS frequency band is separated into two distinct sub-bands – one used exclusively for satellite and the other used exclusively for terrestrial communications – is inefficient and could be problematic in the L-band

MSV's claims prevent a potential ATC operator from using satellite frequencies in a fashion that is different ("modified") relative to the usage of the frequencies by the satellite (or satellites) of the system – modification implies either a subset of the satellite frequencies or any other modifications including a reduction of power in certain bands. There are many reasons why an ATC operator would use a "modified" version of the satellite band frequencies. One important reason relates to interference management. Not having the ability to use a modified range of satellite band frequencies in the ATC prevents a potential ATC

[17] These patent filings are particularly identified and described further in Annex A, attached.

[18] Claim 101 reads as follows: An ancillary terrestrial component for a satellite radiotelephone system that includes a space-based component that is configured to receive wireless communications from radiotelephones over a first range of satellite band return link frequencies and to transmit wireless communications to the radiotelephones over a second range of satellite band forward link frequencies that is spaced apart from the first range, the ancillary terrestrial component comprising:

- an electronics system that is configured to transmit wireless communications to the radiotelephones over a modified second range of satellite band forward link frequencies.

Claim 213 reads as follows: A radiotelephone comprising: an electronics system that is configured to communicate with an ancillary terrestrial component by receiving wireless communications from the ancillary terrestrial component over a modified second range of satellite band forward link frequencies.

operator from using the most spectrally-efficient and interference-free architectures for the ATC implementation. A second reason that makes the above claims important relates to the nature of frequency allocations in the L-band wherein there are some narrow non-contiguous blocks of spectrum that may be used for narrowband satellite services but cannot be used for broadband ATC services. Given a broadband ATC deployment (based on a 3G or 4G air interface protocol) an ATC operator may not have a choice but to use a "modified" range of satellite band frequencies in the ATC. In such instances, an operator would be infringing the above claims.

MSV's U.S. Patent 6,684,057 includes 305 claims each of which defines preferred frequency reuse methods, systems, and apparatus. Such approaches are the preferred methods of deploying an economically viable MSS/ATC network.

MSV's U.S. Patent 6,892,068 (149 claims) defines additional MSS/ATC frequency reuse techniques in the context of a dynamic and reconfigurable system. Claim 136 addresses dynamic modification of the space and terrestrial segments, including real time capability to assign and reuse frequencies and power between the space segment and the ATC system[19].

According to this claim, the terrestrial segment is allowed to reconfigure itself by "assigning, reusing and/or borrowing" frequencies from the satellite cell that is covering the same geographic area as the terrestrial segment or from another distant satellite cell. This claim is important for it allows for reconfiguration/adjustment of the ATC frequencies following an initial deployment/configuration. Since no system remains static in its frequency utilization (owing to dynamically changing traffic/capacity demands), this claim protects an essential attribute of a commercially attractive ATC architecture. Other claims in the same patent protect dynamic allocation/reallocation of frequencies between geographically distinct satellite cells of the MSS/ATC hybrid system. An attempt to avoid these claims would force a potential MSS/ATC operator to deploy a rigid, non-dynamic (commercially unattractive) system with fixed frequency allocations (capacity) for both the satellite (MSS) and terrestrial (ATC) segments.

C. Satellite Beam Forming

Another key area of MSV's patent efforts relates to beam forming techniques that relieve the satellite(s) of complexity while improving system performance. Ground-based beam forming patent filings include techniques whereby the geographic location of a user device is discerned from a return link transmission, thereby enabling the system to select an optimum subset of satellite antenna feed element signals for processing, and detection of information. In other claimed embodiments, a reduced number of forward link beams may be formed over a desired satellite footprint compared to the number of return link beams in order to reduce the power expended by the satellite. Still other claims recite frequency translation techniques whereby a frequency segment of the feeder link is translated to the service link frequency band.

These techniques afford an ability to dynamically modify satellite spot beams (cells) in order to reduce interference and maximize spectral efficiency between the satellite and terrestrial cells.

[19] Claim 136 reads as follows: A method of assigning and/or reusing frequencies between one or more communications systems comprising the steps of:

- configuring a first satellite spot beam having a first set of frequencies associated therewith and comprising a first substantially central portion;
- configuring a second satellite spot beam having a second set of frequencies associated therewith and comprising a second substantially central portion;
- configuring at least one terrestrial cell within the first satellite spot beam having a third set of frequencies associated therewith and having at least partially overlapping coverage with the first spot beam; and
- assigning, reusing and/or borrowing, by the terrestrial system, a portion of the second set of frequencies and/or a portion of the first set of frequencies used in the first central portion, responsive to predetermined criteria associated with the third set of frequencies, including assigning, reusing and/or borrowing at least one of the second set of frequencies when the second set of frequencies are at least substantially geographically distant from the first satellite spot beam.

D. Advanced Network Management

MSV's network management patents reflect the "nuts and bolts" of managing such a technically advanced system and include patent filings covering multi-system integration techniques, load balancing techniques, power control techniques, and the like.

One of the awarded claims in this area deals with the ability to operate the satellite and the terrestrial sub-networks autonomously in terms of resource management[20].

Once the available MSS frequencies have been allocated to the satellite(s) and to the ATC, it is highly desirable for the ATC and the satellite(s) to exercise autonomy in using their respective frequency allocations (the satellite network cannot be establishing calls for the terrestrial network and vice versa). The above claim protects this essential feature of autonomy for both the MSS and the ATC. Subject to the above claim, a potential ATC operator would not be able to configure the ATC or the MSS to "substantially autonomously" determine channel availability, as would be essential for a commercially viable hybrid system. An attempt to avoid the "autonomy" claim would force a potential ATC operator to centralize the function of determining channel availability and channel assignment for the satellite and terrestrial sub-networks. This would make for a commercially impractical system. All terrestrial networks that have been deployed to date function autonomously subject to decentralized architectures.

The above represent just a handful of ATC patent areas covered with MSV's patent filings, largely based on the patents issued to date. Thousands of additional patent claims have been published, and are expected to issue over the course of the upcoming year. A thousand or more additional patent claims, reflecting yet additional system permutations and refinements, are awaiting publication. Moreover, MSV continues to file for additional patents.

While MSV was leading the regulatory path for ATC, it was also leading the technology development path, a strategy it continues to follow.

The comprehensive lead that MSV has achieved on MSS/ATC hybrid system patents provides a sustainable competitive advantage and presents significant obstacles to other MSS/ATC hybrid system deployments. The following summary chart further highlights the ATC technology status differential between MSV and others and includes a summary of the commercial implications for ATC systems architected without the benefits of the patented design areas.

[20] Claim 81 of MSV U.S. Patent 6,859,652, for example, reads as follows: A method of assigning to a requesting subscriber unit a communication channel commonly shared between a space based communication system and a ground based communication system, comprising the steps of:

- configuring a first satellite spot beam, associated with the space based system, having a plurality of communication channels associated therewith;
- configuring at least one terrestrial cell, associated with the ground based system, that at least partially geographically overlaps the first satellite spot beam;
- requesting by a dual mode subscriber terminal a communication channel;
- at least one of the ground based system and the space based system substantially autonomously determining channel availability; and
- assigning to the requesting dual mode subscriber unit at least one of an unused channel and, for reuse with the dual mode subscriber terminal, a used channel having a sufficiently weak signal strength.

ATC Feature	MSV Patent Coverage?	Other Company	Potential Consequence
Spectrum reuse by the two components of the hybrid system (MSS and ATC)	√	?	Only alternative of band segmentation is also subject to MSV patents
Band segmentation by the two components of the hybrid system	√	?	Only alternative of spectrum reuse is also subject to MSV patents
Interference management and interference reduction techniques	√	?	Alternative is reduction in quality of service, capacity for space segment and ATC network
Using substantially the same air interface over MSS and ATC	√	?	Alternatives are different air interfaces resulting in larger and more expensive user equipment (no transparency)
Transparency satellite and associated signal processing	√	?	Alternatives are the use of legacy satellites without transparency
Transparent user equipment	√	?	Alternatives are larger, more expensive equipment with higher battery drain
System design allowing for substantial autonomy for MSS and ATC operations in establishing communications	√	?	Alternatives are impractical. A nation-wide ATC must be able to function autonomously in using its resources to provide service (typical of all cellular networks)
Mobility Management	√	?	Alternatives are no ATC to MSS handover resulting in dropped calls

Table 2 – ATC Patent Filing Comparison in Certain Broad Areas of Intellectual Property

In addition to the above high-level comparison, Annexes A and B[21] below list the specific MSV patent filings (currently published). In short, ATC cannot effectively and efficiently be implemented on a commercially viable basis without the benefits of MSV's patent portfolio.

IV. CONCLUSION

ATC unlocks the commercial potential of MSS and ensures broadband wireless communications everywhere, anytime. Key benefits of an MSS/ATC hybrid network include a truly ubiquitous broadband communications service via transparent devices, network scalability driving dramatically reduced equipment pricing and unparalleled spectrum efficiency that is superior to terrestrial-only offerings. MSV is dedicated to the ATC vision and has established itself with the system architecture, technological know-how and patents to implement its vision. MSV is the leader and innovator in dedicating the use of substantial spectrum resources for integrated MSS/ATC hybrid services. MSV's technology and associated patent portfolio cannot be replicated, establishing MSV's asset as one-of-a-kind broadband wireless platform. Based on patents already issued to MSV, a commercially viable MSS/ATC hybrid network is not viable without infringing on MSV's intellectual property.

[21] All U.S. issued and published patent filings of MSV are available for public inspection at www.uspto.gov.

ANNEX A

EXEMPLARY[22] MSV PATENT FILINGS TO DATE COVERING ATC FREQUENCY REUSE, ALLOCATION, CONTROL, AND PLANNING

Patent Filing	Coverage	Claims
Systems and Methods for Terrestrial Reuse of Cellular Satellite Frequency Spectrum (9301-00002)	U.S. (U.S. Patent 6,684,057) Europe Canada Mexico Australia	305 claims issued in the U.S. Additional claims are pending in the U.S. and abroad.
Wireless Communications Systems and Methods Using Satellite-Linked Remote Terminal Interface Subsystems (9301-00003)	U.S. (U.S. Patent 6,856,787) Europe Canada Mexico Australia	125 claims issued in the U.S. Additional claims are pending abroad.
Spatial Guardbands for Terrestrial Reuse of Satellite Frequencies (9301-0004)	U.S. (U.S. Publ. 03/0054761A1) Europe Canada Mexico Australia	81 claims published in the U.S. Additional claims are pending abroad.
Systems and Methods for Monitoring Terrestrially Reused Satellite Frequencies to Reduce Potential Interference (9301-00005)	U.S. (U.S. Publ. 03/0054814A1) Europe Canada Mexico Australia	94 claims published in the U.S. Additional claims are pending abroad.
Multi-Band/Multi-Mode Satellite Radiotelephone Communications (9301-00007)	U.S. (U.S. Publ. 03/0054762A1) Europe Canada Mexico Australia	46 claims published in the U.S. Additional claims are pending abroad.
Coordinated Satellite-Terrestrial Frequency Reuse (9301-00038)	U.S. (U.S. Patent 6,892,068) Europe Canada Mexico Australia	149 claims issued in the U.S. Additional claims are pending in the U.S. and abroad.

22 MSV's comprehensive issued patent portfolio includes over 800 issued and 500 additional published patent claims to date. In addition, MSV has filed over 100 additional patent applications since 2001.

ANNEX A

EXEMPLARY MSV PATENT FILINGS TO DATE COVERING ATC FREQUENCY REUSE, ALLOCATION, CONTROL, AND PLANNING

Patent Filing	Coverage	Claims
Coordinated Satellite-Terrestrial Frequency Reuse (9301-00042)	U.S. (U.S. Publ. 04/0023658A1) Europe Canada Mexico Australia	152 claims published in the U.S. Additional claims are pending abroad.
Integrated or Autonomous System and Method of Satellite-Terrestrial Frequency Reuse Using Signal Attenuation and/or Blockage, Dynamic Assignment of frequencies and/or Hysteresis (9301-00043)	U.S. (U.S. Patent 6,859,652) Europe Canada Mexico Australia	106 claims issued in the U.S. Additional claims are pending in the U.S. and abroad.
Staggered Sectorization for Terrestrial Reuse of Satellite Frequencies (9301-00075)	U.S. (U.S. Publ. 03/6153308A1) Europe Canada Mexico Australia	56 claims published in the U.S. Additional claims are pending abroad.
Systems and Methods for Increasing Capacity and/or Quality of Service of Terrestrial Cellular and Satellite Systems Using Terrestrial Reception of Satellite Band Frequencies (9301-0079)	U.S. (U.S. Publ. 04/0203742 A1) Europe Canada Mexico Australia	32 claims published in the U.S. Additional claims are pending abroad.
Systems and Method for Handover Between Space Based and Terrestrial Radioterminal Communications, and for Monitoring Terrestrially Reused Satellite Frequencies at a Radioterminal to Reduce Potential Interference (9301-00084)	U.S. (U.S. Patent 6,879,829) International Coverage Forthcoming	34 claims issued in the U.S. Additional claims are pending in the U.S.
Intra- and/or Inter-System Interference Reducing Systems and Methods for Satellite Communications Systems (9301-00087)	U.S. (U.S. Publ. 05/0037749 A1) International Coverage Forthcoming	88 claims published in the U.S.
Systems and Methods for Modifying Antenna Radiation Patterns of Peripheral Base Stations of an Ancillary Terrestrial Component to Allow Reduced Interference (9301-00088)	U.S. (U.S. Publ. 05/0026606 A1) International Coverage Forthcoming	72 claims published in the U.S.

ANNEX A

EXEMPLARY MSV PATENT FILINGS TO DATE COVERING ATC FREQUENCY REUSE, ALLOCATION, CONTROL, AND PLANNING

Patent Filing	Coverage	Claims
Systems and Methods with Different Utilization of Satellite Frequency Bands by a Space-Based Network and an Ancillary Terrestrial Network (9301-00099)	U.S. International Coverage Forthcoming	Claims pending.
Satellite/Hands-Free Interlock Systems and/or Companion Devices for Radioterminals and Related Methods (9301-00100)	U.S. International Coverage Forthcoming	Claims pending.
Systems and Methods for Space-Based Reuse of Terrestrial Cellular Frequency Spectrum (9301-00112)	U.S. International Coverage Forthcoming	Claims pending.
Systems and Methods for Monitoring Selected Terrestrially Reused Satellite Frequency Signals to Reduce Potential Interference (9301-00115)	U.S. International Coverage Forthcoming	Claims pending.
Satellite/Terrestrial Wireless Communications Systems and Methods Using Disparate Channel Separation Codes (9301-00118)	U.S. International Coverage Forthcoming	Claims pending.
Prediction of Uplink Interference Potential Generated by an Ancillary Terrestrial Network (9301-00151)	U.S. International Coverage Forthcoming	Claims pending.
Reusing Frequencies of a Fixed and/or Mobile Communications System (9301-00155)	U.S. International Coverage Forthcoming	Claims pending.
Interference Reduction in Forward Link Satellite Communications by Predistortion (9301-00158)	U.S. International Coverage Forthcoming	Claims pending.
Interference Reduction in Satellite Communications by Excision (9301-00159)	U.S. International Coverage Forthcoming	Claims pending.

ANNEX B

EXEMPLARY[23] SPACE-SEGMENT RELATED MSV PATENT FILINGS

Patent Filing	Coverage	Claims
Systems and Methods for Reducing Satellite Feeder Link Bandwidth/Carriers in Cellular Satellite Systems (9301-00006)	U.S. Patent 6,937,857 Europe Canada Mexico Australia	Patent issued by the U.S. Patent Office with 47 claims. Additional claims are pending in the U.S. and abroad.
Space-Based Network Architectures for Satellite Radiotelephone Systems (9301-00073)	U.S. (U.S. Publ. 03/0068978 A1) Europe Canada Mexico Australia	76 claims published in the U.S. Additional claims are pending in the U.S. and abroad.
Satellite with Different Size Service Link Antennas and Radioterminal Communication Methods Using Same (9301-00092)	U.S. International Coverage Forthcoming	Claims pending.
Code Synchronization in CDMA Satellite Wireless Communications Systems Using Uplink Channel Detection (9301-00093)	U.S. International Coverage Forthcoming	Claims pending.
Multi-Band Satellite and/or Ancillary Terrestrial Component Radioterminal Communications Systems and Methods with Diversity Operation (9301-00095)	U.S. International Coverage Forthcoming	Claims pending.
Methods of Ground-Based Beam Forming and On-Board Frequency Translation and Related Systems (9301-00108)	U.S. International Coverage Forthcoming	Claims pending.
Apparatus and Methods for Power Control in Satellite Communications Systems with Satellite-Linked Terrestrial Stations (9301-00109)	U.S. International Coverage Forthcoming	Claims pending.

[23] MSV's comprehensive issued patent portfolio includes over 800 issued and 500 additional published patent claims to date. In addition, MSV has filed over 100 additional patent applications since 2001.

ANNEX B

EXEMPLARY SPACE-SEGMENT RELATED MSV PATENT FILINGS

Patent Filing	Coverage	Claims
Space-Based Networks and Methods with Ground-Based Beam Forming (9301-00114)	U.S. International Coverage Forthcoming	Claims pending.
Electronic Antenna Beam Steering Using Ancillary, Asynchronous, Pilot Channel Receivers (9301-00120)	U.S. International Coverage Forthcoming	Claims pending.
Satellite Communications Systems and Methods Having Shared Ground Infrastructure (9301-00149)	U.S. International Coverage Forthcoming	Claims pending.
Adaptive Beam Forming with Interference Suppression and Multi-User Detection in Satellite Systems with Terrestrial Reuse of Frequencies (9301-00152)	U.S. International Coverage Forthcoming	Claims pending.
Methods and Systems Providing Adaptive Feeder Links for Ground-Based Beam Forming (9301-00153)	U.S. International Coverage Forthcoming	Claims pending.
Intra-System and/or Inter-System Reuse of Feeder Link Frequencies Including Interference Suppression Systems and Methods (9301-00154)	U.S. International Coverage Forthcoming	Claims pending.
Satellites Using Inter-Satellite Links to Create Indirect Feeder Link Paths (9301-00157)	U.S. International Coverage Forthcoming	Claims pending.
Satellite Communications Systems and Methods with Distributed and/or Centralized Architecture Including Ground-Based Beam Forming (9301-00161)	U.S. International Coverage Forthcoming	Claims pending.

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