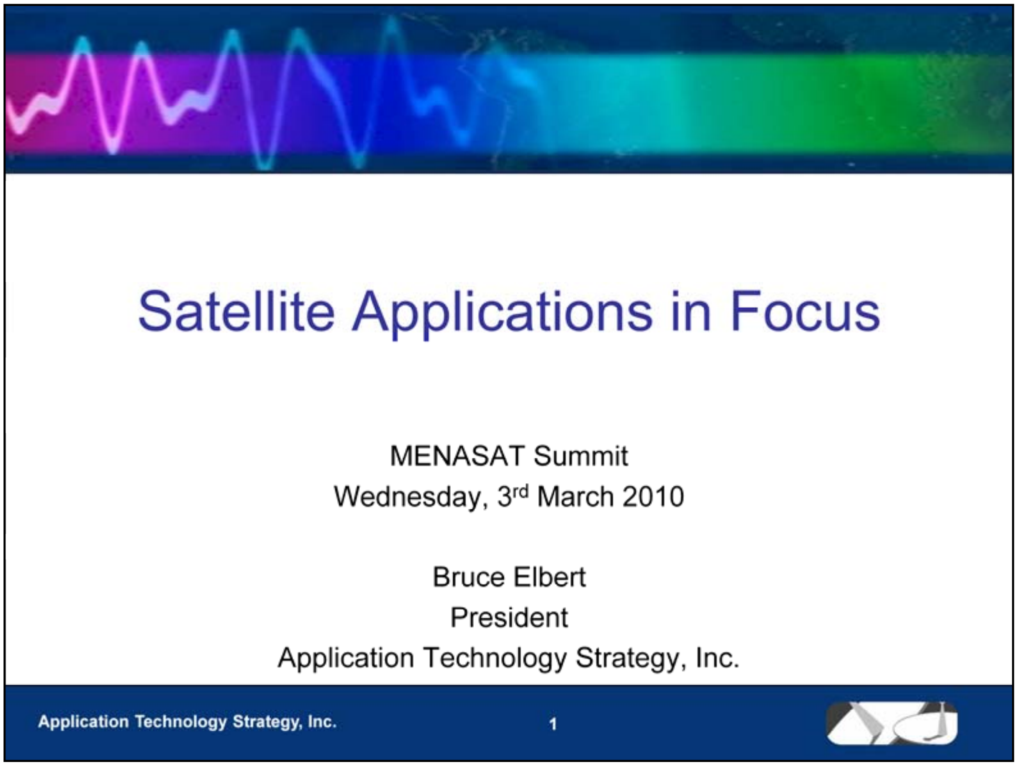
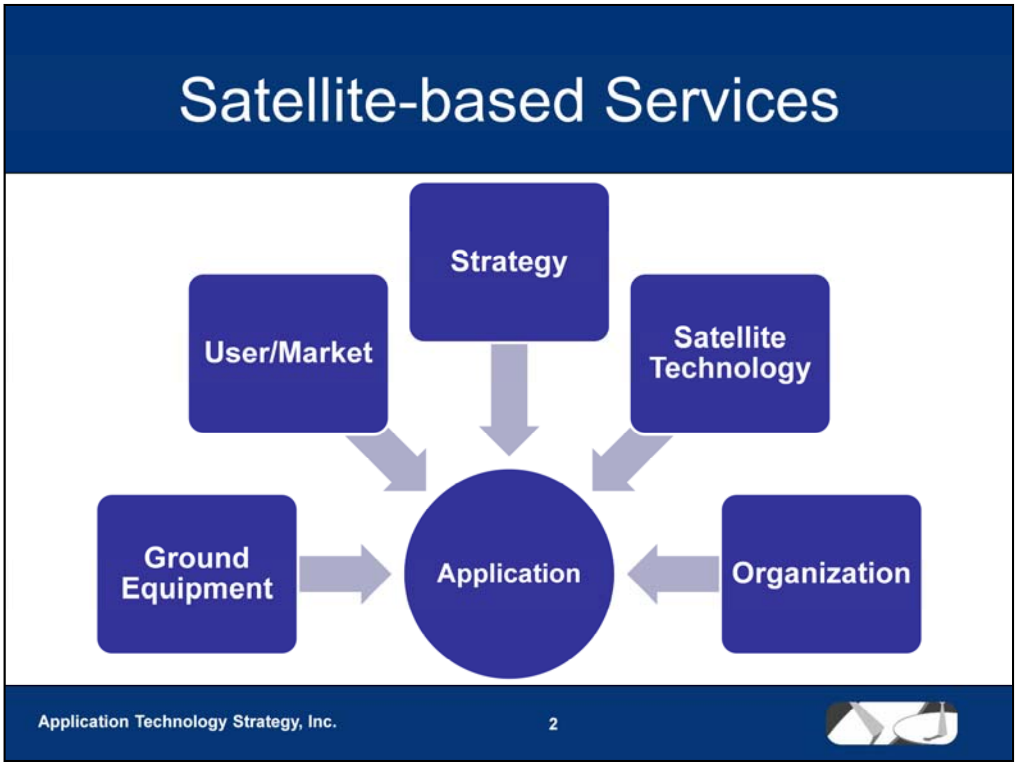


Users are attracted to a variety of applications in media and telecom; however, satellite-based applications are unique in their dependence on the space segment that orbits the earth. In regions like the Middle East and North Africa (MENA), satellite applications have a special place because other forms are taking longer to extend their reach. This is not to say that the public in highly-developed areas like the UAE and major cities in Saudi Arabia are denied access to modern telecom facilities like broadband and digital TV. But the majority of the MENA population still relies heavily on satellite TV in ways not seen in other parts of the world. This makes the satellite business especially important and valuable within this region, allowing indigenous companies to share the wealth with global players.



A typical satellite application is dependent on the five primary elements illustrated in this diagram. The key element is the Satellite Technology itself, as we'll discuss shortly, the other elements are dependent on it. This is coupled with an established user community and the market it establishes. Our understanding of both the technology and the market are extremely critical to success. Ground equipment comes next, benefiting from advances in consumer electronics and software. Consequently, satellite networking products have similar price points, familiar look and feel, and are capable of working with other devices in the home or office such as the PC and digital TV set. Around all of this is the organization of the operator and the groups that support the end user in one form or another. The fifth element in the diagram represents the business strategy that results from the particular arrangement of the other four elements.

What Do Users Want?

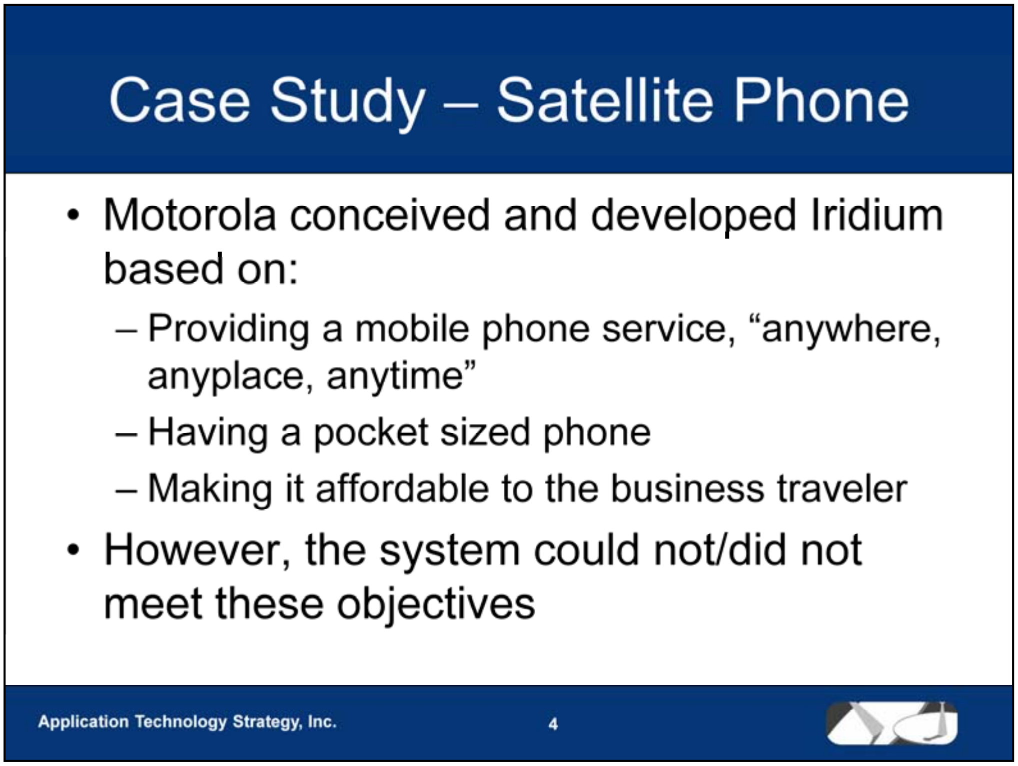
- As much as they can get

• How much do they get?

- As much as they can afford

Application Technology Strategy, Inc. 3

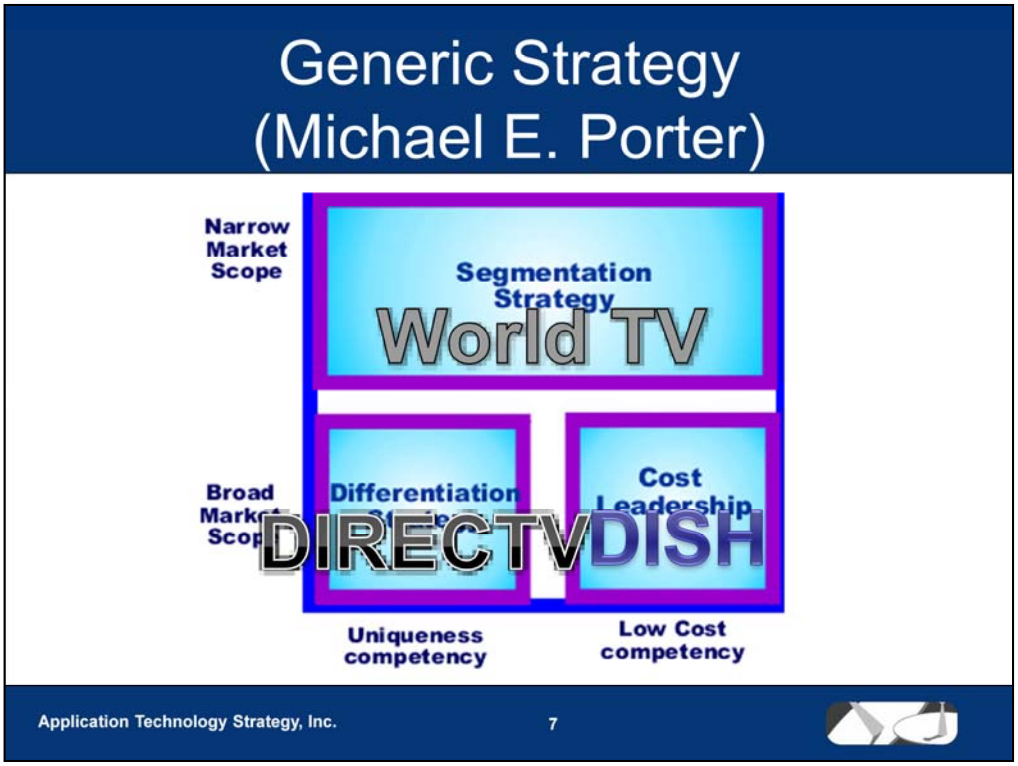
In addressing the user, we are compelled to try to understand their needs and wants. Simply stated, users want more and they want it at a price they can afford.



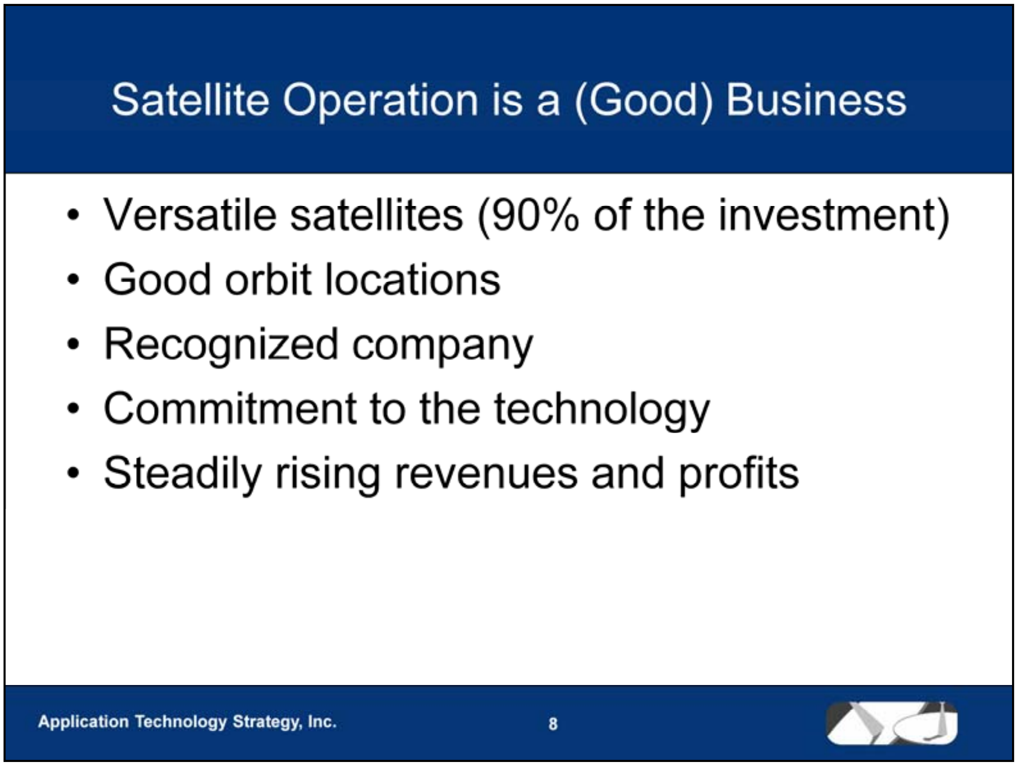
Let’s take a look at what was a very innovative satellite application introduced by Motorola back in the last decade. The Iridium system was developed and delivered by Motorola to provide a cellular-like service from Low Earth Orbit (LEO) to satellite phones that were supposed to be pocked sized. That was an essential element of making Iridium attractive to the primary market needed to make the system a successful business. The Iridium slogan promised a mobile telephone service that was available, “anywhere, anytime and anyplace”. If they could have achieved that with a pocked sized phone, and at a price point affordable to the requisite million subscribers, then they could have met the obligations of their business plan. At about $3.6 billion, the system was certainly expensive to build, but could still have become profitable under its assumptions. The reality was that even at this price, the satellites could not deliver a service on planet earth that was available, “anywhere, anyplace and anytime”. Its limitations became known to the public immediately after phones were handed to prospective users and they made their first calls.

Early mockups of the Iridium subscriber unit were indeed pocket-sized with antennas not much different from those on early cellphones. However, what Motorola actually produced for the market was more like a shoe or brick size, and weighed a pound. The antenna is as big as a cigar, needed to assure that adequate signal could be sent and received for satellites that would be located anywhere in the sky. As illustrated here, a user must stand out in the clear to preclude blockage from buildings, hills and thick foliage, and be sure that the antenna remained erect.

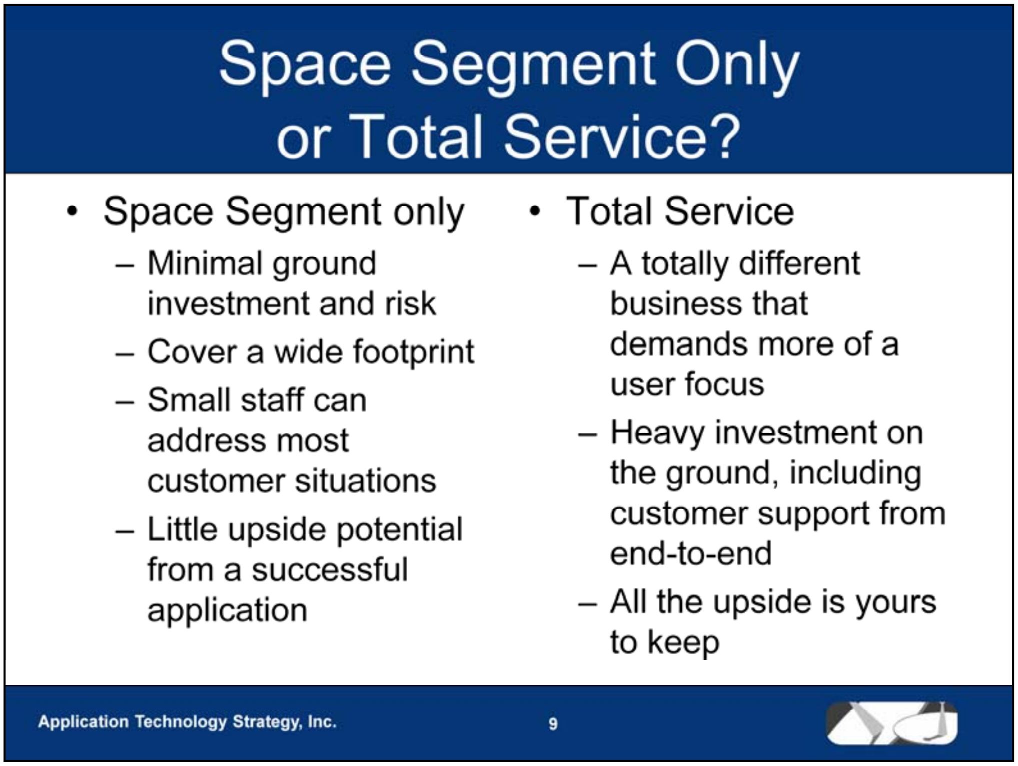
While you could place and receive calls over Iridium (provided you were outside in the clear), the service was unattractive to the target market. This fundamental problem was further exacerbated by the rapid expansion of the GSM standard, which resolved the roaming issue. So, a business traveler could roam across Europe, North America, Asia and Africa with a single GSM phone and not need Iridium to solve that particular problem. In time, satellite phones were produced that were indeed pocket sized, as illustrated by those for geostationary satellite systems like Inmarsat and Thuraya. However, the latter two systems are targeted to specialized industrial and government markets which are willing to pay the price and live with the limitations.



So, business strategy in satellite applications dictates that we know and properly address our market, and that the satellite technology be appropriate. Consider now the overreaching aspect of business strategy outlined by Michael E. Porter, a Harvard Business School professor and author of the landmark book, *Competitive Strategy*. As illustrated above, his three generic business strategies include cost leadership, differentiation, and segmentation. The first two allow the business to address a broad market scope, while the third is associated with a narrow market scope. I would say that in the US satellite TV market, DISH positioned itself as the low cost leader while DIRECTV endeavors to differentiate itself through special programming such as sports packages and a greater quantity of HD content. As a result, DIRECTV seems to be able to charge a higher price per subscriber, on average, than DISH. Market penetration of the two has been very impressive and neither seem to suffer from their strategic choice. It is interesting to note that they are each gravitating toward the other's strategy as they launch higher-powered satellites and add content channels. A look at narrow market focus brings us to DTH operator World TV. GlobeCast acts as a aggregator of foreign language and other ethnic programming and delivers it over one satellite to the US. A user wishing to receive the service purchases a compliant antenna and set top box, and pays World TV a nominal fee. The channels themselves are Free to Air (FTA), a model familiar in the MENA region. Equipment is not subsidized as for the other subscription satellite services, but the programming costs next to nothing. The penetration is perhaps a few million subs, which while insignificant overall still provides GlobeCast with a reasonable business.



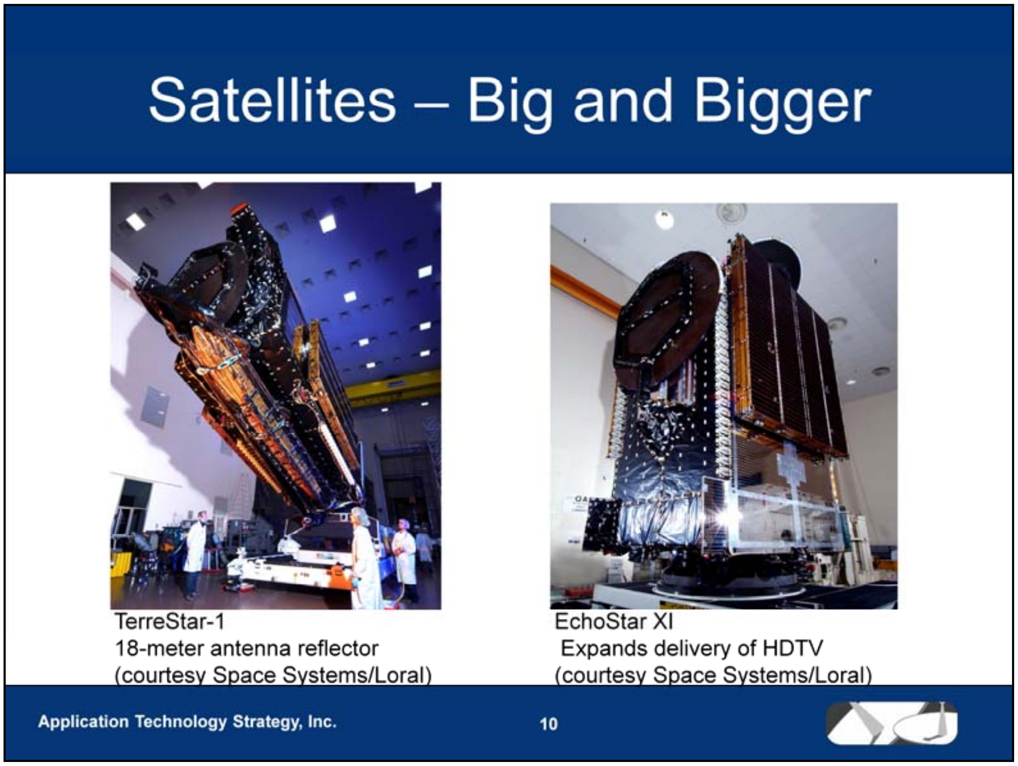
Putting up and operating satellites can be a good business in and of itself. Here, we are talking about Intelsat, Arabsat, NileSat, Eutelsat and others, who sink substantial sums into the space segment and sell the bandwidth from these satellites to network operators. The five bullet points in this chart provide a formula for success in this business. With the vast majority of cost tied up in the satellites, the operator must acquire enough good customers to retire the dept and fund operation. Professor Porter would present this in the form of a value chain wherein the excess over CAPEX and OPEX is the margin that makes the investor happy. To get there, we need good orbit positions and coverage of attractive markets. Based on experience, North America, Europe and MENA offer good markets. Network operators deal with satellite operators they know and trust. To get into the latter position, the satellite operator must continue to invest in new satellites when there is a need and incorporate new features to make those satellites more effective for applications provided by their customers. Revenues from selling or leasing satellite bandwidth will steadily rise, and the profits will grow as well.



A satellite operator has two structural approaches to consider: concentrate on supplying pure satellite bandwidth (space segment only), or provide an application that includes space and ground components (a total service to end users). While both are based on the large investment in satellites and a long-term commitment to operation, the two have decidedly different cost, risk and opportunity profiles.

Space Segment only – this is the origin of our business and was initiated by COMSAT with the Intelsat system. It evolved through several domestic/regional systems like Telesat Canada, Palapa Indonesia, Galaxy and Eutelsat. Today, most geostationary satellites employ this business model. Over 90% of investment and operating cost is involved with the satellites themselves; the cost of ground facilities is minimal. It is a benefit to the operator to have a wide coverage (footprint) to encompass many attractive markets. A small staff addresses customer acquisition and service since customers develop their own ground segments and applications. As a result, any upside from a successful application accrues to the customer of the satellite operator and not the satellite operator itself.

Total Service – this is a very different business because the emphasis is on finding individual customers and addressing their respective needs. Included is a heavy investment in a ground segment, along with the acquisition and distribution of user terminal devices. The overall operator must address all customer issues, including providing access to external resources (content, the Internet, etc.). All of the upside accrues to this operator as does all risk.



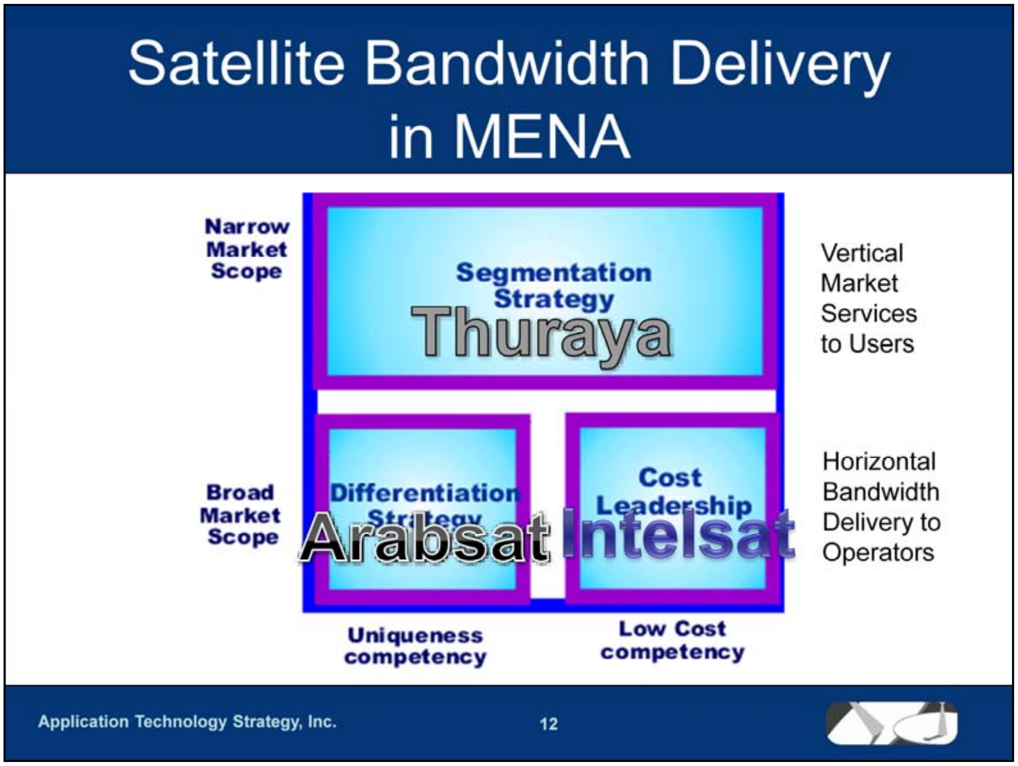
Whatever the nature of the satellite network and application, the satellite itself is at its center. Satellite technology has evolved over the decades and as the slide indicates, the satellites themselves are big and getting bigger. We are speaking of satellites that employ the geostationary orbit to remain fixed with respect to points on the ground and can individually view approximately one third of the earth's surface. I recently toured the satellite factory at Space Systems/Loral and was very impressed by the quantity of large, high performance satellites that were in the final phase of assembly and test. The two shown represent advanced application capabilities from satellites with nearly 20 kW of prime power. TerreStar-1 is intended for interactive mobile communications for the general public and public safety users. EchoStar XI is the latest in a long series of DBS satellites that deliver digital TV programming to US consumers. The intent of EchoStar XI is increased capacity for HDTV service through higher power and improved signal processing. Both TerreStarr-1 and EchoStar XI are bent pipe repeater satellites, meaning that all signal processing and switching are performed on the ground.

Spaceway

- Hughes Communications
- Spacecraft Boeing 702
- Launch date - 2005
- Orbital slots
  - 101degrees West longitude
  - 99 degrees West longitude
- Contract life 12.6 years
- Payload
  - Regenerative processing payload with hopping downlink spot beams, capacity of 10 Gbps per spacecraft
  - Receive multihorn shaped beam with dual offset fed Cassegrain reflectors
  - Transmit 1500 element phased array, 2m diameter, forming multiple hopping spot beams
- Bus
  - 12.3 kW (EOL summer solstice)
  - Mass (BOL) - 3832 kg (8441 lbs)
  - Mass (EOL) - 3691 kg (8130 lbs)

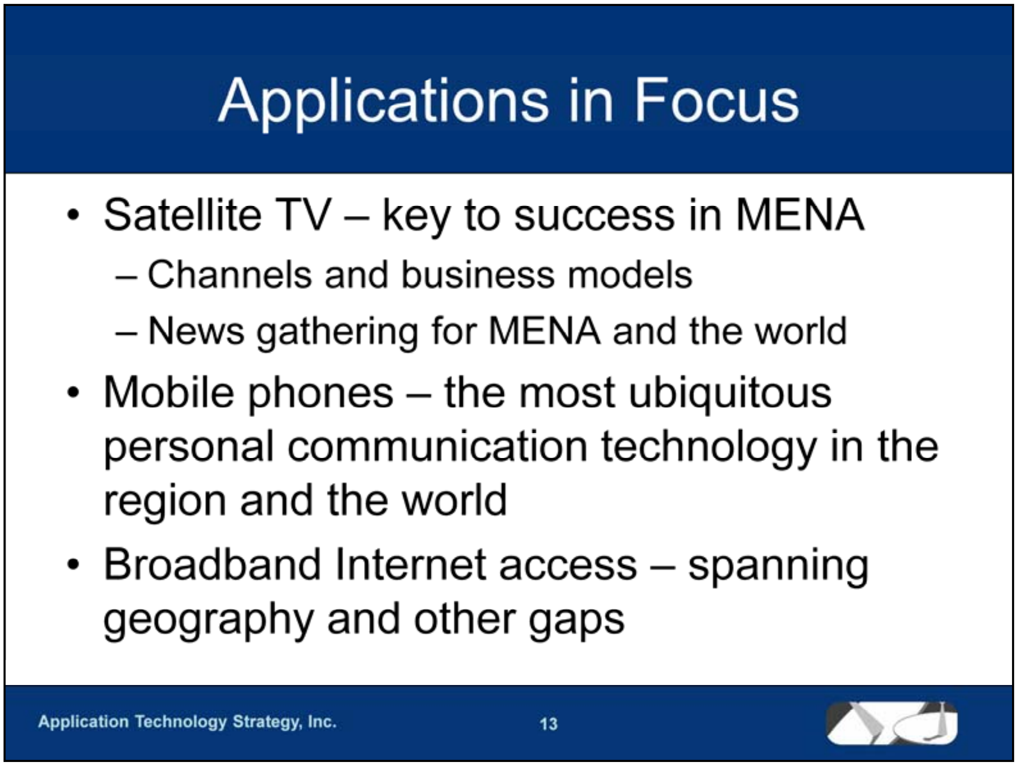
The Spaceway satellite was developed over a ten year period and launched in 2005. Using a digital processing payload and phased array antenna with1500 transmit elements, Spaceway achieved the milestone of a broadband in-orbit switch capable of mesh network performance. The first two satellites are owned by DIRECTV for DBS coverage, while Spaceway 3 is employed by Hughes Communications for advanced VSAT applications. Among the latter is multi-site video teleconferencing on a single hop basis, which was intended to be the foundation of this innovative concept. Hughes is currently offering the mesh capability to local, state and federal government agencies for routine communications and disaster recovery. This kind of system would have proven vital had it been available following Hurricane Katrina.

Spaceway is very interesting to note because its design is tightly coupled to the application. Thus, as the application succeeds or fails, so does the satellite investment. The one caveat to this is that Spaceway, being a digital processing satellite, can be configured to provide conventional hub-based services to VSATs and for TV (hence its use by DIRECTV). By employing Ka-band and dynamic beam forming, Spaceway can redefine its mission throughout its operating lifetime.



Michael E. Porter's grid indicates how each of the current MENA regional operators employs a generic strategy. Intelsat and Arabsat satellites have a broad scope with a horizontal market thrust of providing bandwidth to network providers. Because of its global coverage with the most satellites, Intelsat has the cost leadership position and relies on its competency of buying, launching and operating satellites with the lowest effective cost per transponder. Arabsat, on the other hand, has a marginally higher cost due to operating fewer satellites; however, it differentiates itself with unique competency in the MENA region. Intelsat can grab the individual transponder customer but Arabsat has the better MENA business through aggregation of satellite TV services. Both Intelsat and Arabsat do not compete with customers by trying to serve end users. In contrast, Thuraya has a narrow market scope by addressing some vertical market segments in the mobile communications field. They are not trying to provide the highest bandwidth to end users for the lowest cost. Rather, they work to deliver a reasonable communications capability (voice and medium speed data) to end users with portable devices. Thuraya can charge a higher price per Mbps, which is fortunate as it costs them more to obtain it.

I have left out the subject of competition, which is addressed in Proter's Five Forces Model. Industry rival firm NileSat follows the Arabsat business strategy, as likely will YahSat. But other competitive forces include competing technologies (terrestrial wireless and wired services), powerful customers (TV networks and enterprises that purchase capabilities), and suppliers (satellite manufacturers and launch providers). Government regulation is another area that impacts business strategy and results.



Satellite applications in MENA follow similar lines from other developed regions.

The biggest, Satellite TV, is the most valuable with its many satellites. Most satellite TV channels in MENA are FTA and hence revenue flows from the broadcaster to the satellite operator with little else to consider. As channels find advertiser sponsors and premium channels gain acceptance (and produce subscriptions), business models in MENA will become more robust.

The introduction of an indigenous MSS operator in the form of Thuraya found MENA to be accepting of the satellite phone than was the US or Europe. Still, its primary attraction is where telecommunications infrastructure is either poor or has been disrupted by a natural catastrophe or war.

Lastly, we see the ever-rising broadband Internet segment. Major cities in UAE, Saudi Arabia, Egypt and Jordon, for example, have good infrastructure that offers DSL and 3G cellular services. Once you are outside of these cities, there is no broadband Internet to speak of. This is the region that will drive the satellite broadband segment. Currently, VSATs are employed by governments and enterprises with special needs, but the consumer is still cut off. YahSat plans to address consumer broadband with YahClick; to the extent that they and others bring in a low cost solution, the market for satellite broadband will probably flourish.