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“Market dominance of this magnitude does not come from doing things wrong”

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“Hughes has stayed with the pace, generally making the right judgements and reading the market’s demand better than its competitors”

“The company lives and breathes the technology at all levels from chipsets to installation, not least because it lays claim to have started the industry with its work in the early to late 1980s”

“Hughes’ achievement really has been monumental both on its own account and on behalf of the industry”

“Hughes has managed to achieve the virtually impossible”

“Hughes has managed to walk the tightrope between innovation and proven reliability which service providers in the enterprise business require to the exclusion of almost anything else”

“Hughes is the only company to have developed a platform that competes and wins at the highest and most specialised levels of the market as well as in the mass consumer business – this is achieved on a single, unbelievably flexible operating platform”

“Wal-Mart’s adoption of a VSAT system from Hughes in 1983 was described by Fortune Magazine in June 2005 as one of the 20 “epic decisions [which] were breathtakingly smart” and made history”

“the first lesson for all other VSAT system vendors: never take your eye off Hughes.”
1. **Summary**

Hughes’ presence casts a shadow over almost every player in the market. Its dominance of the enterprise VSAT industry is remarkable in the fact that the company has been able to sustain its lead for over twenty years and that it has rolled with the punches and constantly responded with new developments which has kept it at the forefront of an intensely competitive market. Customers purchase HNS VSAT systems because it is the market leader, understands competitive pricing and has cutting edge products, but also because there is a confidence that the company will always overcome any problems and the system will work reliably.

Hughes’ DNA is in engineering and this has formed the basis for a solid, functional and flexible product platform that has been the foundation of its long-term success in the market. However, its hardware platform has increasingly become the main tool in the company’s primary objective to build a strong service business rather than the sole source of revenues. Hughes carries this message into those customers that purchase its products – that its own strength and experience in enterprise and consumer VSAT services gives both its products and, as a consequence, its operator customers an edge that other vendors cannot offer.

Hughes is finely in tune with the market and misses little. Looking back, its product releases either catch the wave or begin it in the first place and the engineering machine which lies at the core of the company is continually advancing the platform and introducing new features. Hughes is the only company which has been able to demonstrate sustained leadership in technology, market share and financial results in the VSAT business. This undoubtedly gives its customers a confidence which cannot be matched by others.
2. Market Performance

2.1. Data Sources & Study Methodology

The information in this Executive Briefing was compiled from the latest 14th Edition of the COMSYS VSAT Report, unless expressly indicated. Apart from information and product data already held in our library, primary research was conducted with over 300 operators, manufacturers and users to gather up to date information. Visits have been made to a large number of existing and potential suppliers and service providers in Europe, Asia/Pacific, Africa, Latin America and North America. COMSYS maintains an extensive database on the interactive star, mesh DAMA and SCPC VSAT markets and tracks a wide variety of information for all individual networks. This forms the basis of most of the statistical analysis in this report.

2.2. Financial Strength

Hughes Network Systems LLC (HNS) is a wholly-owned subsidiary of Hughes Communications Inc. (HCI), itself a wholly-owned subsidiary of EchoStar Corporation. EchoStar acquired Hughes – which had been traded on the NASDAQ, but substantially controlled by the Apollo private equity group – in February 2011 for $2 billion. EchoStar’s primary business is the manufacture of digital television set-top boxes, management of Dish’s OTT Sling service and capacity sales on its fleet of satellites. The company is listed in the NASDAQ under the stock ticker SATS and is part of a group, which includes DISH network, controlled by Charlie Ergen. Apollo had acquired HNS through SkyTerra from the DirecTV Group, in a complex series of deals which finalised in November 2005. Since its formation more than 30 years ago, Hughes has had the same management team, virtually unbroken with the exception of a few retirements, even through all of the various transactions the company underwent between 2003 and 2011.

HNS has a wide-ranging business in satellite equipment manufacturing and services. It manufactures a range of VSAT products based on the HN7000S, HN9000, HX and HT systems, the latter of which now operate on the latest HG200 DVB-S2X platforms released in July 2016, launched its first Ka-band, spot beam Spaceway satellite with coverage of the United States in 2007, followed up by the 120 Gbps Jupiter-1 (EchoStar XVII) satellite in 2012, and operates leading VSAT service businesses in North America, Europe, Brazil and India. EchoStar reported revenues for Hughes’ business in 2012 of $1.35 billion with its various service businesses – the biggest of which is the North American service covered in this section – accounting for the largest proportion of this. EchoStar no longer breaks out the Hughes service revenue detail, but COMSYS understands that the company’s North American enterprise services have consistently accounted around 18 per cent of all Hughes’ revenues.

Hughes is the 800 pound gorilla of the VSAT market and even the largest of the company’s competitors generally try and work around it rather than go head-to-head. Those companies that let their attention wander or make the mistake that theirs is a segment Hughes has no interest in, get a rude awakening. The fact of the matter is that VSAT is Hughes and, in many ways, Hughes is VSAT. The company lives and breathes the technology at all levels from chipsets to installation not least because it lays claim to have started the industry with its early work in the early to late 1980s. As its positive financial results demonstrated every quarter since it went public in 2007 and until it was swallowed by EchoStar, what sets the company apart today and drives its growth is the
service business. Beyond technology and product innovation, over the past several years Hughes has successfully morphed into being the leading broadband satellite service provider in North America, Europe, India and Brazil as well as supplying a growing list of operators and service provider customers in the rest of the world with its broadband technologies and products.

Furthermore, being a leading service provider that uses its own products adds immeasurably to Hughes’ advantage when operators are deciding on Hughes technology versus the competition. HNS has managed to walk the tightrope between innovation and proven reliability which service providers in the enterprise business require to the exclusion of almost anything else. The company has consistently beaten its competitors to the punch in terms of the delivery of new breakthroughs in technology — in mid-2016 it released the first DVB-S2X VSAT platform at least six months ahead of every other competitor. A few years ago its customers enjoyed a real head-start in efficiency when the company hit the streets with the first DVB-S2 ACM platform, more than a year ahead of anyone else and there are examples of operators who gained a critical advantage in the market as a result.

HNS has stayed with the pace, generally making the right judgements and reading the market’s demands better than its competitors. The past two years have seen Hughes retain its position once more as the leader of the industry in terms of both shipments and orders. It recorded over a third of all enterprise VSAT shipments in 2015 and over half in 2014. Major sales included technology refresh deals, extensions and new networks with GTECH and the Digital Cinema Distribution Coalition in the US, MinTIC in Colombia, Bank of Baroda and the State Bank of India, Primacom in Indonesia, Vodacom in the DRC, Yahsat for AY3 over Africa, KB Iskra in Russia, Dexar in Turkey and many others. 2016 has also seen the company achieve a high degree of success with its latest Jupiter platform selling over 40 per cent of all terminals to the likes of KBZ Gateway and SeaNet in Myanmar, DirecTV and ARSAT in Argentina and PSN in Indonesia. Alongside all these deals, Hughes retains a very strong presence in the growing Ka-band market with the likes of Yahsat, Avanti, MNLA, Xplornet, ISRO and RSCC. The past two years have seen a decline in shipments primarily due to the increasing saturation of the Jupiter-1 satellite and the consequent slowdown in consumer sales. A similar situation can be seen in the two years prior to 2012 before Jupiter-1 came online and we are confident that the launch of Jupiter-2 (EchoStar XIX) with its 200 Gbps payload will result in another explosion of demand.
2.3. Consumer Dominance

Hughes was the instigator of the satellite consumer internet market more than 15 years ago and has led the way ever since. The entrance of the company’s only major direct competitor, WildBlue, only served to raise the awareness of satellite broadband. As a result, the entire market potential grew and this benefited all players. The Jupiter-1 satellite and accompanying Jupiter VSAT system significantly raised transmission rates and IP throughput on the terminal and we expect similar advances with Jupiter-2. As of end-2015, Hughes’ market share of the satellite consumer internet subscribers in the United States had hit 55 per cent – up from 54 per cent two years previously. The performance of Hughes’ consumer business has been even more impressive than its enterprise services, growing almost 14 per cent in net new subscribers in 2014 and over 6 per cent in 2015. At the end of 2015 the company had over one million subscribers on its consumer platform although 2016 flattened out as the service ran out of capacity and awaited the arrival of Jupiter-2 – now successfully launched and awaiting commercial instigation. Three years ago, our last report lauded the fact that Hughes’ gross monthly subscriber additions were in excess of 20,000. Then, in 2013 this rose to an average higher than 50,000 and ironically, even with the decline in net subscriber additions since 2015, the number of new installations a month remains greater than 30,000. For the VSAT business this is a massive amount – just for its own HughesNet service the company is manufacturing 50 per cent or more VSATs a month than some of its competitors manufacture in a year! Hughes is undoubtedly able to use this volume to help drive down manufacturing costs. However, the company is primarily focused on subscriber growth and this rose to over a million subscribers in the US by mid-2016 – another first for Hughes.

Hughes announced the inauguration of its HughesNet consumer service for Brazil in July 2016 based on the most recent Jupiter2 platform. There have been no successful unsubsidised satellite consumer services outside North America but in early 2017 the company announced that its Brazilian service had reached 40,000 subscribers and was growing at rates of approximately 500 new users per day – a take up of almost 15,000 subscribers per month. Clearly Hughes do Brasil has managed to combine its local knowledge with a new team of people and, in the company’s own words, the “priceless experience” of the US business. Once again, Hughes has revealed a future path of opportunity – this time for consumer internet services in developing markets, not just for its own business, but for the market as a whole by finally proving that they are a viable proposition given the right business model and expertise. HNS’ HughesNet consumer service shows the value of its strategic positioning as the company is able to carry its consumer service through the resources that it has in place for its enterprise business which, in turn, feeds off the volume generated in the consumer business. Once again, it appears that Hughes holds all the right cards.
2.4. Global Presence

Hughes has maintained its position as the leader of shared VSAT services in North America – head and shoulders above its nearest competitor. As we have commented in our previous reports when a company dominates a market to the extent that Hughes does – holding nearly 70 per cent of the managed enterprise VSAT business – it becomes hard to imagine that it can grow its share much more. Its progress is inexorable and its customer list is a testament in itself. Its nearest competitor has about a quarter of the number of sites Hughes has in service and the second largest player on a global basis after Hughes in the United States is .... Hughes in India!

HNS’ aggressive pursuit of the service business has been a key element of its business strategy for some years now – it was the first to recognise the change in the market as demand switched from private networks to shared solutions and it adapted quickly. This was no small task for an engineering-based company, an issue some of its competitors continue to experience.

However, it is really the company’s leverage of its position in the enterprise market and the expertise its managed VSAT service platform allowed it to build over 30 years of leadership which now carries it forward. Everything from network engineering and program management to sales channels and solutions consultancy have contributed to a hybrid managed services solution that competes strongly against even the largest carriers in the United States. Hughes is the only vendor with both a strong hardware business and a large service operation with strength at all levels - technical, operational, sales and financial - to make a real difference in the VSAT and the satellite marketplace.

It faces competition from many sides, but this is no different from how it has always been and now some of the newcomers need to look over their shoulders to see what’s coming up behind them. Hughes is not blind to this and, in 2015, announced a $50 million investment in the OneWeb LEO initiative – a project that most believe is the most likely LEO project to succeed and for which Hughes is designing and building the gateway structure. Expected to work side by side in a complementary way with GEO services, OneWeb is an indication of how Hughes envisions the future and consistently strives to stay at the front of the curve. Over almost 30 years of reporting on Hughes’ business, COMSYS has finished the assessment of the company’s business with the same statement. Once again, we have no reason to change this because it is quite simply true - it is easy to criticise a market leader, but market dominance of this magnitude does not come from doing things wrong.
Internationally, the company also plays a leading role in all of the markets in which it competes and, where it does not have its own operation, it is usually the supplier to the dominant VSAT service provider.

Hughes Communications India (HCIL) is the most successful of the Indian VSAT operators with around 106,500 star data VSATs in service as of June 2016. In total, Hughes has delivered over 190,000 VSATs to India for shared, private and operator customers. Its service is the largest in the country. The company currently has over 300 enterprise and government accounts which include companies and organisations like State Bank of India, HDFC Bank, UFO Moviez, Real Image Media Technologies, Central Bank of India, Vodafone, ICICI Bank, ITC, Sony India, Reliance Industries, the Bombay Stock Exchange, Bank of India, British Gas, Diebold Systems and Tata Communications along with government customers such as Indian Railways, Indian Navy, NIC and ONGC. As of the end of 2015, Hughes India was the market leader for shared hub services in India – a position it has held for more than five years in a row – accounting for almost 40 per cent all the TDMA VSATs in service.

Hughes do Brasil had almost 14,000 sites for both end-user and operator enterprise customers by the end of 2016. It also operates small business broadband services sold through a network of resellers in Brazil which account for about 15 per cent of this total. The company’s operator customers include Telefónica, Oi and Copel Telecom. End-users include Votorantim, Ipiranga and Martines Group. At the end of 2016 the company had a 16 per cent share of the TDMA enterprise VSAT market in Brazil and was leading the consumer market in terms of both sites and innovation.

Hughes Europe is the largest provider of enterprise VSAT networks and satellite broadband services in Europe. The company currently has almost 15 enterprise accounts with just under 37,000 enterprise sites in service and a small number of broadband subscribers sold through a network of value added resellers. Enterprise reference accounts include Shell, Camelot, Volkswagen and BP. Hughes Europe introduced its own version of Hughes’ Unified Broadband service during 2006 and, since that time has signed several major contracts to provide a managed hybrid network solution. Other terrestrial accounts include Avis, BP, Body Shop and Shell. In total, the company now supports almost 50,000 managed sites including managed networks for customers, such as iWay in Africa.
2.5. Vertical Specialisation

Hughes is well known for its ability to serve internet access on both a mass and niche market scale but it also has built a momentum in the corporate networking sector which is hard to challenge and helps it build specialisation and recognition in a particular industry and gives it a great reference list which inspires confidence in other potential customers:

Finance and Banking have long been a core area of expertise. Hughes VSAT platforms are in use in networks for many of the world’s largest banks including several national central banks. Hughes India has pursued the major network bids with a determination that its competitors have begun to find scary. Of the large RFPs for public sector banking and ATMs the company took the lion’s share helped by its efficient use of capacity and vertical integration as the manufacturer of its VSAT platform. In Brazil, Hughes built an offer for remote banking and began targeting this segment of opportunity from 2009 onwards and the company informs us that demand remains and it continues to connect many thousands of ATMs and bank branches through its partners.

Lottery networks were once almost an exclusive VSAT user, but cellular has substantially eroded this market segment for all – except for Hughes. The giant in the lottery business is IGT (GTECH) which is not only Hughes’ largest customer, but the largest user of VSAT terminals in the world. Hughes has over 100,000 sites in service for IGT in the US and it was significant that 2008 saw GTECH move its privately operated network in the United States to Hughes’ managed services in a deal worth several tens of millions of dollars. In addition, Hughes has supplied another 40,000 in other countries around the world, including the single largest enterprise account ever signed with Camelot in the UK for 28,000 which Hughes Europe itself installed in record time and which has since grown to 37,000 sites of which 31,000 rely on VSAT.

Cellular Backhaul has been a high growth area for many operators and Hughes has participated strongly with its own service operations, particularly in India and Brazil, but also in other markets where operators use its systems in Africa, Latin America and Asia/Pacific. The company has positioned its Jupiter2 system as a specialised, cost-effective and flexible solution for 4G/LTE cellular backhaul and its HX platform which is being used by operators in Indonesia, South Africa, DRC, Bolivia, Madagascar and elsewhere.
Education is a further segment of specialisation for Hughes. In India the company began its own HughesNet Global Education service in 2002 and this has grown consistently over the last couple of years and now has almost 30,000 students as its Alumni. HCIL has also supplied 15 hubs for the Indian government’s EDUSAT program and currently manages education services through VSAT at more than 3,000 institutions and learning centres across India, as well as the provision of a captive network on its new Jupiter platform for ERNET that it won in 2016. In Brazil Hughes manages over 2,000 sites running distance education for federal, state, and private universities and technical colleges. Operator customers provide educational services in many other countries including Russia, Azerbaijan, Indonesia, China, Mexico, Peru and other countries in Africa.

Media Distribution began as a focus area in North America, leveraged off the company’s dominance in the retail and automotive segments. Hughes acquired Helius, a specialist applications provider that focuses on the IP video market, in 2008 and integrated this technology into its managed service infrastructure to support digital signage, Omnichannel and other pervasive IP video applications. Applications ranging from asset management and protection, front of store displays, digital movie distribution, corporate communication and video conferencing have had a growing representation in the company’s customer base. In India HCIL provides connection for 90 per cent of all cinemas in the country and estimates that 95 percent of Indian film industry revenues are carried by its distribution services. It delivers 12-14 Gbyte MPEG-4 movie files between 25 and 30 times a week to 3,500 UFO Moviez cinemas in India. HCIL was the first company to deploy a DVB-S2 ACM platform in India and believes that the efficiencies of this HughesNet platform have been instrumental in its ability to significantly tap the potential of the video-based market. IPTV initiatives in the retail segment are also an area of development for the company in Asia, Europe and Latin America.

Carrier Extension has grown rapidly over the past few years as VSAT has evolved to become a more integrated part of hybrid networking and business continuity solutions. Through its own services, with the operations in the US and Europe now managing integrated networks and India and Brazil providing service to some of the largest local carriers, Hughes has seen the number of sites it serves expand significantly. Alongside VSAT, Hughes’ enterprise services businesses in the US and Europe serve many large big-brand customers with terrestrial connections only, including clients like Body Shop, BP and Gap. The company makes extensive use of fibre, cable, DSL and 3G/4G cellular services for most of its major customers today and currently supports over 60,000 terrestrial connections in addition to, and often in combination with, its VSAT services.
Retail accounts remain important, especially relating to hybrid services. Hughes essentially kicked off in this area with Wal-Mart which deployed a network across all of its stores in 1985. The edge that this gave the business was recognised by others in the US retail segment and over the following few years most of the major US chain store retailers also installed VSAT networks. Wal-Mart’s innovative decision and the importance of Hughes’ VSAT solution in the company’s massive growth was recognised in 2005 by Fortune Magazine as one of the 20 key business decisions that made history. In the US Hughes it serves many major names including CVS, Rite Aid, Sears and Walgreens (which will have been a Hughes customer for 30 years in 2017!). In Brazil Hughes services several retailers and has networks with the largest supermarkets in Brazil – Carrefour and Pão de Açúcar – through CerejaPRN, a specialist in retail media networks. Gas/Convenience is another area of the retail segment in which that Hughes has performed strongly, both with its own services in North America, Europe and Brazil as well as its operator customers in Africa and Asia.

Government & Defence has been an area of focus for the company where it has sought to leverage the specialist capabilities of its HX platform. Hughes’ HX280 system supports features specifically designed to meet the military’s need for highly customised comms-on-the-move (COTM) mobile terminals capable of supporting multi-megabit mission critical applications. The company has had several notable successes with contracts for the US government in its home market as well as some major contracts in India where it has integrated specialised turnkey network solutions for the Army and Navy. HX units have been ruggidised and conform to Indian MilSpec JS55555.

Mobility is another specialist application that Hughes refined the HX platform to address and has now added to the Jupiter2 platform. The company has deployed high mobility applications which include its partnership with Row 44 to service the aeronautical industry which has the second largest number of VSAT equipped airliners in the world. Hughes also provides the platform for a series of offshore coastal maritime services in the Gulf of Mexico, Caribbean, Brazil, Europe, Western Africa and Asia through Blue Tide and other partners as well as other networks supplied as integrated solutions for various customers, including a global C-band network for Telespazio.

Global Services is an initiative from Hughes which provides satellite broadband services anywhere in the world by leveraging the capabilities of Hughes and many of its service operator/customers around the world. Targeting multi-national organizations, with this service offering Hughes can provide a “one-stop” managed service to a global entity which seeks networking services across a diverse geographic area. Hughes customers for this service include a large credit card company,
African Development Bank, The World Bank, Exxon, Shell, Chevron and Halliburton as well as a large embassy network for a Ministry of Foreign Affairs and a recent re-win of the global CTBTO network. Hughes describes this as a value-added service both for potential users as well as for its various service operator partners.

**Ka-band Leadership**  
It is hard to consider the HughesNet consumer service as anything other than a great result for Hughes. Over one million subscribers is a considerable achievement and one that proves that a market for consumer satellite broadband services undoubtedly does exist. With its growing consumer business in Brazil and forthcoming expansion into other Latin American countries, the company is advancing its own consumer internet business and opening the door of potential for the whole industry. The company has also been successful with other Ka-band consumer projects. Avanti Communications has integrated the HN ground segment for its HYLAS-1 and HYLAS-2 Ka-band satellites which cover Europe, the Middle East and North Africa and, in 2011, Yahsat announced a major reversal whereby the supply of ground segment for the Yahsat-1B Ka-band satellite was switched to Hughes in place of ViaSat. The reasons behind this were complex, but we believe much hinged on the fact that Hughes’ platform was well established with proven and flexible capabilities, and equally important, Hughes was able to provide a back office solution integrated with the platform and contracted to operate the service for Yahsat. Yahsat went on to upgrade its platform to Jupiter2 in 2016 and extend with Hughes for the African coverage of AY3. Other users of Hughes’ platforms for Ka-band and HTS satellites include Media Networks, PSN, Turksat, BSNL/Thaicom, ISRO, RSCC and Eutelsat’s Broadband4Africa.

Hughes was the first to develop a truly integrated business – from the design, manufacture and supply of the terminal to the ownership of the satellite and provision of the service. As a consequence it would seem to us that Hughes has finally reached the summit of a strategy which its vision put in place many years ago. With many of the major satellite operators attempting to follow a verticalisation strategy, they should sit up and take note of what Hughes has achieved and how it did it.
Hughes also leads a comparison between manufacturers of the number of hubs they have sold to service providers and, on average, how many active, billing terminals each hub supports. By this measure of success the company maintains a significant advantage over Gilat and there continues to be a clear gap between these two major players and all of the other vendors - only jilted perhaps by the rise of ‘Others’, due primarily to Newtec’s large wins of recent years. The smaller manufacturers have been pushed into looking for the smaller, perhaps more specialised and maybe less competitive accounts. DVB-RCS vendors have fallen behind in overall return per hub partly due to the fact the product has not been so successful in many of the large projects. ViaSat’s primary role in the enterprise business was its old legacy LinkStar system which remains in use with many operators despite having been end-of-life’d a few years ago. ViaSat’s main focus and sales are on the consumer business and this is not covered as part of this analysis. Unsurprisingly, iDirect trails far down the list with an average of only 100 terminals active on each shared hub that the company has sold. However, it should be noted that, in general, operators tend to use the system for smaller, high value, high bandwidth networks with fewer terminals.

Almost invariably Hughes’ partners and operators have been strong, well connected and have sold well. It is no coincidence that operators of Hughes hubs have, on average, many more billing VSATs on their systems than their competitors or that the company’s ship to service ratio is the highest of any of the major vendors. In terms of simply running its VSAT business from a basic value perspective, the company has managed the two parts - international and North America - almost flawlessly.
2.7. System Leadership

Hughes continues to outperform in all aspects of the business - new sales, major upgrades and contract extensions – and its momentum and expertise make it a hard competitor to beat. 15 years ago, HNS was primarily a hardware vendor - and today it is clearly a service company which still leverages its deep and proven engineering and technology development capabilities to maintain its competitive edge. As the market leader since the industry’s inception Hughes Network Systems has been charged with almost every fault imaginable by its various competitors at various times, but the results can be judged on their own merit – dominance of this magnitude does not come from doing things wrong.

We continue to hold the opinion that Hughes has the edge on its competitors because of its organisation, depth of market presence, experience, vertical integration and the fact that if it is ever behind with product features it is never far behind. For the potential purchaser, the fact that buying Hughes is rarely a mistake counts for a great deal. Jupiter is one of the cutting edge systems available in the market today and given all that we know about its extended consumer and enterprise architecture and vastly increased processing capabilities, will be an exciting prospect for many. The HX addresses more capabilities in segments which have never really been in Hughes’ sweet spot before and supports some incredibly powerful networking features that are unlocking new potential demand and taking Hughes deep into segments it only scratched at in the past. It is clear that Hughes’ plan is to maintain this strategy with the incorporation of these features into Jupiter-2. Finally, there is also the obvious focus on the opportunities for hybrid networking which COMSYS has identified as possibly the largest influencing trend on the VSAT market today. As evidenced by the continuing development of the Active technologies in the HughesON portfolio, Hughes is investing heavily in hardware and software products that aim to bind satellite and terrestrial infrastructure together in a unified solution and we have no doubt that this is a capability that Hughes will export to its various partners around the world. Given all of this, there is every reason to suppose that Hughes’ strength in depth, greater developed services business and increased responsiveness to the market will be more than enough to maintain its leadership of the industry.
3. Platform Features

In total, HNS has manufactured significantly in excess of 5.8 million units since launching its first VSAT product over 30 years ago. The HughesNet platform has been a major success for Hughes with over two million units sold into the enterprise market and HNS’ own HughesNet consumer offering now supporting over one million subscribers in the United States.

3.1. The Hughes Product Family

The latest JUPITER System platform has a rich history with its origins back to Hughes’ pioneering role first in enterprise services in the mid-1980s with the PES and then in consumer internet services in the mid-1990s. There followed a series of fast steps which took the product through the DirecWay series, the HN, the HX and then the first of the HT JUPITER series of platforms. Each of these releases significantly expanded the system’s capabilities, adding full routing functionality, embedded VOIP service functions, data acceleration and optimisation as well as a constant reduction in the cost of the remote terminal. At the same time, the company was adding or improving the ability to efficiently carry IP traffic, sustain quality of service levels and manage mass market subscriber bases at both the network performance and business process levels.

A consistent design criteria for each new system release has been to minimise cost, driven by the fact that the original product was targeted at the North American consumer market. Whilst today the HughesNet consumer service is a major pillar of HNS’ revenues and growth, the company’s latest JUPITER platform has been designed to address both the consumer and enterprise segments in developed and developing markets. With each new platform, functionality and capability have increasingly been integrated into the terminal and bandwidth efficiency has become a key element in new systems. HNS has committed major R&D efforts in this area, working towards substantially improving the operational cost of owning its system as well as further enhancing its efficiencies. The company incorporates its own web acceleration and optimisation software in its systems. Known as TurboPage, this feature uses a variety of techniques to reduce the amount of bandwidth required during a web session and, in 2012, Hughes introduced its latest version incorporating a capability it terms ‘ActiveCompression’ which uses a two-stage process involving long range byte-level caching followed by V.44 compression and which can improve the efficiency of HTTP traffic by as much as 50 per cent.

Extensive QoS features are provided via a standards-based classification of traffic types, primarily reliant on latency sensitivity, which allows an operator to assign bandwidth based on a variety of schemes including Committed Information Rate (CIR), on-demand Committed Bit Rate (CBR), Adaptive CBR (Outbound and Inbound) and backlog-based assignment. Hughes also has its own proprietary acceleration, optimisation and compression applications and algorithms which it claims significantly improves performance and removes some instances of latency through spoofing techniques and caching, appreciably raising user experience. With increasing security and encryption of many websites, acceleration - which requires access to packet headers - is effectively blocked, but Hughes has devised an alternative method of accelerating encrypted traffic through a different access scheme. Not only is this applicable to standard web surfing, we are led to believe that it also has application in the military segment.
3.1.1. The JUPITER System

With the launch of the Jupiter-2 satellite Hughes began developing the latest Jupiter platform in 2015 and this was released commercially in mid-2016. Based on an upgraded system-on-a-chip (SoC) and the incorporation of the DVB-S2X waveform for the outbound channel, Hughes was the first company to bring DVB-S2X to market for a shared TDMA VSAT platform. Once again, Hughes led the pack in its development efforts – a few years ago it had a commercial DVB-S2 platform a year in front of its competitors and now has a similar lead for DVB-S2X.

The second generation Jupiter VSAT platform incorporates two new gateway products – the HG240 for high throughput (HTS) systems and the HG220 for more traditional widebeam satellites. The HG220 carries many of the same features and functions of its larger sibling, offering a scaled down version for smaller systems, but is quite capable of also supporting smaller HTS deployments that are becoming more common in other parts of the world. A single HG220 is able to support multiple networks on the forward channel and multiple return channels over five different outroutes. The design is based on a single blade chassis and servers integrated with the demodulators and modulators in a configuration Hughes terms a Satellite Modem Cluster (SMC). These gateway stations are designed to be operated autonomously in a “lights out” fashion and deployed in multiple locations, each supporting several uplinks of several Gbps.

The latest VSAT terminal range for the Jupiter system consists of five different modems. The HT2000 series are all based on an upgraded Hughes-designed SoC ASIC named Sahara - bringing much more memory and processing capability and allowing even greater performance to meet the demands of today’s consumers, which are increasingly driven by high speed video streaming applications. The SoC uses a new wideband waveform, capable of supporting channels of 200 Msp or more with modulation rates up to 64APSK and IP throughput rates up to 200 Mbps at the remote terminal. The new SoC has essentially doubled the terminal’s throughput and we expect to see this increase further over time as the full resources of this very powerful chip are unlocked by future software releases. The HT uses Hughes’ latest generation of integrated ODU which is not only smaller, lighter and more streamlined than previous generations, it only requires a single IFL cable helping to make the VSAT easier to install – self-install being another feature which Hughes supports in the Jupiter platform.

The high density Jupiter platform is a natural choice for any operator looking to build a business around a similar model to HughesNet in the United States. The system has been built on many years of experience serving the consumer market and whilst things like terminal pricing, network operations, bandwidth efficiency and management, IP functionality and optimisation are all critical factors, very few alternative platforms can demonstrate networks of more than 10,000 remotes and no other vendor has a system running more than a million subscribers. Whilst there are one or two alternative platforms running several hundred thousand users, the capability to install, manage, troubleshoot, bill and upgrade this number of users is something that Hughes dominates at this time and is inherently part of the Jupiter platform.

The latest Jupiter NMS is integrated into the HG gateway platform and provides advanced diagnostic functions with real time status and historical performance for both the gateway and remote sites. Depending on the network and satellite beam structure, several different configurations are supported ranging from management of a stand-alone gateway to control of
multiple gateway systems with a ‘manager of managers’. Automatic hands-free remote terminal commissioning is supported, but if required, individual or groups of terminals can be manually brought into service. The system also supports APIs through the implementation of RESTful which allows standards-based integration with other OSS/BSS products. The NMS also includes an integrated set of Host Network Operator (HNO) and Virtual Network Operator (VNO) capabilities which enable an HNO to establish and operate multiple independent VNOs, each of which can be provided with a logical partition of network resources including bandwidth. VNOs can be weighted relative to one another so as to enable high-value VNOs to be provided resources at a higher rate relative to lower value VNOs.

Naturally, the next question is just how a consumer-optimised platform of this type would be of any interest for the enterprise market, but this is where the HG220 gateway comes into play. With the advent of the second generation system and the HG220, Hughes has accelerated the process of porting all of the additional features and functionality from the HX to Jupiter. The HX was originally designed to provide a lower cost entry point for those operators looking to serve a small number of sites, but with far greater demands in terms of data rates, greater QoS granularity, application support and SLAs. Ultimately we believe that Hughes’ vision is to consolidate all levels of capability – high-end corporate, large scale enterprise and consumer internet – on to a single platform allowing it to expand the addressable market for any operator and not restrict potential addressable opportunities.

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The enterprise market remains very important to Hughes and one of its real triumphs has been in its delivery of a system and terminal which leads both the consumer and enterprise segments of the market in functionality and price competitiveness. This is a product that scales from networks of a handful of high-value sites demanding individual QoS to millions of consumer subscribers – no other vendor is able to come close to such a claim. By rights, this should be a system of compromises, kludges and shortcomings, but instead it commands around half of annual global sales and leads each market in which it plays in terms of features, performance and price. With such a competitively positioned product and a reputation for delivering advanced features on time and providing a high level of support, Hughes is very hard to beat.

Without exception, every one of these Jupiter users has expressed their satisfaction with both the product and the support they have received from Hughes. A common comment often made has been that the system and the company delivers what it promises – no features that suddenly are “under development”, no additional costs for things that were thought to be included and high levels of support. In the UK we have a slogan which was originally part of an advertisement and which is now widely used – “it does exactly what it says on the tin” and this seems a very appropriate description of Hughes’ Jupiter system.
3.1.2. The HX System

The HX System was designed specifically for smaller networks with a high quality of service requirement. Hughes took the basic structure of the larger HN system of the time – including the DVB-S2 ACM outbound, inbound access schemes and the management system – as the core of the HX. For this reason, observers can be forgiven for initially thinking the HX is little more than a cost reduced version of its larger brother, but this is not the case. The ability to deliver high levels of guaranteed service in a much more granular way that large scale enterprise systems need, or can even cope with, is one key feature and this was possibly the largest task that Hughes set out to deliver in its HX System. Despite the fact that the company had a great deal of technology which could simply be lifted out of the HN System, most if not all of the QoS software systems, including the algorithms, were completely re-designed.

As a consequence, when launched the HX offered an almost unique combination made up from the advantages of highly scalable, efficient, low cost technology taken from a proven and successful product coupled with a hub system and IP architecture designed from the ground up and incorporating several other high-end networking features. These include optional 256 bit AES encryption and significantly expanded quality of service capabilities with the ability to set service guarantees by individual remote terminal and specific application. These include:

- Constant bit rate providing a uniform transmission rate to avoid jitter in applications such as voice and video.
- Minimum committed information rate (CIR), guaranteeing the throughput of a connection, with fixed steps to a maximum limited rate.
- Minimum CIR with best effort to a maximum limited rate.
- Best efforts services - weighted fair queuing.
- Class-based weighted prioritisation.

QoS is also tied to an operator-defined priority queue which sets four levels of IP traffic and allows the system to prioritise and rate limit the least critical traffic in an ordered fashion.

Hughes currently supports four HX terminal models all of which operate off the same hub chassis with the HX50 serving as the base model:

- **HX50**: operates with the standard Hughes proprietary RF range, has one serial and two Ethernet ports.
- **HX200**: replaced the HX100 and HX150 and differs from the HX50 in that it can support higher symbol transmission rates (up to 6 Mspvs versus 1 Msp) and comes in an enclosure which is both stand-alone and rack-mountable. It is able to operate with either the Hughes proprietary saturated RF unit or industry standard linear L-band BUCs. The terminal can also support spread inbound channels as an option (which requires additional equipment at the hub) and has the ability to take a GPS reference for mobile services.
- **HX260**: is where things become really interesting because the terminal supports all the attributes of the HX200, but adds a fully featured mesh capability.
- **HX280**: is the “Rolls Royce” of the range, incorporating all the features of the HX system as standard as well as several specific additional capabilities. These include spreading and other mobility functions, AES256-based FIPS 140-2 cryptographic security and Enhanced Signalling Security which protects all data, management and signalling traffic.
A great deal of work was also done in the initial design to simplify and integrate hub sub-systems with the aim of reducing the cost and size of the NOC. This was achieved by combining the IP and satellite gateways, consolidation of ports and reducing the number of servers. The HX incorporates a standalone, frequency scanning burst demodulator – the Configurable Demodulator System (CDS) – able to support multiple inbound channels across a defined frequency range. The CDS operates up to 10 Msps with a start-up licence of 2.5 Msps upgradeable to 10 Msps – with each able to demodulate up to 9 channels simultaneously, all of which can be configured with different modulation and FEC rates. Not only does this approach bring the total cost of ownership for an inbound channel down substantially, it also further enhances Hughes’ AIS feature. Maximum inbound channel rates of 6 Msps allow carrier rates for the star element of a network of around 9 Mbps. The development of the CDS brought even more potential to the HX than it did for the HN because it is the main foundation for the technology which underlies the HX mesh networking abilities.

When we first reported about the HX in 2008 the direction and ambition that Hughes had for the platform was clearly laid out. However, the mesh feature surprised even us with its level of functionality and cost effectiveness. The HX platform is designed to operate not just as a full mesh, peer-to-peer network, but as a multi-star or hybrid network. As previously mentioned, the system uses the CDS technology as its basic building block, although for mesh a 2 Msp unit is used rather than the 2.5 or 10 Msp units available for the hub. The HX260 demodulator incorporates the same technology as a hub station CDS which allows it to receive and demodulate up to four channels simultaneously, each with different data rates, modulation and FEC. Thus, a network can be quickly set up, controlled ultimately by the HX hub, with any-to-any connectivity between HX260 remotes. Additionally, it has a range of low cost star terminals – the HX50 and HX200 – that can be integrated seamlessly into a hybrid mesh/star solution.

The HX has another trick up its sleeve, however, with a separate gateway option. An HX mesh gateway terminal consists of a Traffic Manager (two for a redundant arrangement) and up to eight mesh units (based on the CDS technology) – HX260 routers – which together can support 16 Mbps of capacity running up to 32 channels. The system can start small with a Master Traffic Manager and a single HX260 (CDS) and grow incrementally, adding redundancy if required. Several mesh HX gateways can also be used in the same network. This allows multi-star networks to be deployed in an extremely cost effective manner because the list price on the HX260 modem is only $3,500. The HX mesh solution requires an external appliance to support TCP/IP PEP for a connection, but it does incorporate most of the other IP services from the star configuration.

Of almost equal importance, the combination of the CDS and Hughes’ release of its own hub modulator, has allowed the company to re-package its IF channel hub hardware components. From a point a few years ago where a new IF chain would effectively require an operator to purchase another hub, Hughes is now able to provide this capability for around $70,000 – making it the first vendor at the time to meet iDirect’s strategy head-on with an alternative product. The HX system was originally targeted towards operators focused in highly defined market segments, such as the maritime stabilised business, oil & gas, mining, embassy networks and multi-national corporate segments. It has also firmly targeted the demand for high speed satellite backhaul circuits from the GSM operators and the military’s need for highly customised mobile terminals capable of supporting multi-megabit mission critical applications – this is clearly the role for which
the HX280 was specifically designed. However, in many ways the HX has also become the workhorse for more generalised enterprise networking for many operators.

Since its initial launch, Hughes has added further to the HX’s capabilities. The platform now comprises a large share of Hughes’ international sales and development of the system has been generally faster and more adaptable than its larger siblings, the HN and Jupiter. The addition of the HX90 brought support for the latest adaptive LDPC inroutes. Mesh multicast is also incorporated with dynamic links created on the detection of multicast traffic. Hughes has also improved the ability to set up videoconferencing between different sites with a single screen set-up. The initial entry cost for an operator has not been ignored either and the HX comes with a minimum outbound capacity of 768 kbps expandable in 500 kbps steps, allowing a service provider to start operations with a minimal amount of investment in satellite capacity and then grow in a much more scalable fashion.

The HX has emerged as Hughes’ go-to product for mobility and military markets. It supports traffic switching between beams – a necessity for maritime, aeronautical and other mobile services – as well as global roaming, allowing terminals to transition between different hubs based on the same NMS. A new advanced waveform was introduced in early 2013 which enabled Ku and Ka-band communication through rotary wing platforms – helicopters – on a variety of commercially available airborne antennas. In addition, the HX TGW100 transportable gateway provided for a compact quick deploy hub able to support star and mesh links for small networks and there is also a compact card configuration of the HX280 designed to allow integration by third parties into specialised terminal configurations, such as lightweight man-packs. This system is targeted at the military segment, but other customers including civilian security, digital SNG providers or even operators which need a very fast deployment might also find a use.

The platform fulfils the promise that Hughes made for it when it was first launched and has become a fully-rounded product for operators in the specialised vertical segments. It took a while for the HX to gain traction with the customer base, but then acceptance and adoption showed a marked sales pick-up and the product was a tremendous success for Hughes which sold 40 HX NOCs within the first year of its release. The HX was the first new platform Hughes developed that appears to have had its design origins driven from the demands of the international market rather than the domestic US, but there are applications and potential customers in North America also. In this, as in other areas, there have been some surprises for Hughes also as unanticipated sources of demand are uncovered. The HX’s comms-on-the-move and military capabilities also opened up segments that Hughes has not been strong in historically as it focused on larger volume opportunities.

4. About this Report

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