**DSS Manual: Satellite Network Group**

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# **DTH**

Direct to home (DTH) technology refers to the satellite television broadcasting process which is actually intended for home reception. It is aimed at competing with cable TV distribution services by providing higher quality satellite signals with more number of channels.

The DTH network includes a variety has infrastructure spread across the country, along with transponders placed in the satellites.

* A state-of-art broadcast facility situated at Manesar with the RF-Headend
* The Diversity site at Bangalore with the DR-Headend
* Transponders on 2 ISRO satellites: INSAT 4 CR and SES-7.

Airtel DTH currently has a customer base of 5 million subscribers since launching its operations in October 2008.

## **Products and Services**

1. Digital TV: Standard Definition TV uses the latest mpeg-4 DVB S-2 sound and picture format for superior quality.
2. HD TV: High definition TV and Recording allows viewing in HD with 7.1 surround sound and recording in HD and 3D.
3. NVOD: Numerous VOD (Video on Demand) and PPV (Pay-per-view) services
4. Applications: Applications and software like the EPG (Electronic Program Guide) and Active Services are provided to enhance user experience.

## 

## **Infrastructure**

The headend facility can be broken down into 4 main components and sub-components:

1. *Head end Sub-component:*

The head end or the front end system is the heart of the network and the source of all signals. The system consists of video and audio compression encoders, multiplexers and other components to start the processing of incoming signals.

This can be further broken into 2 major processes:

Compression: Content Acquisition:

* Receiving Antennae o Mpeg-4 Encoder
* IRD (Integrated Receiver Decoder) o Multiplexer
* Video Route o Modulator

1. *Applications and Middleware:*

The middleware is installed in the system to integrate the essential software for the working of DTH services. A number of applications and software must also be loaded that enable the customer to use the services through the STB (Set Top Box).

* User Management System -Billing
* CAS (Conditional Access System)
* Software and Applications
* NVOD (Near Video on Demand)

1. *RF sub-system:*

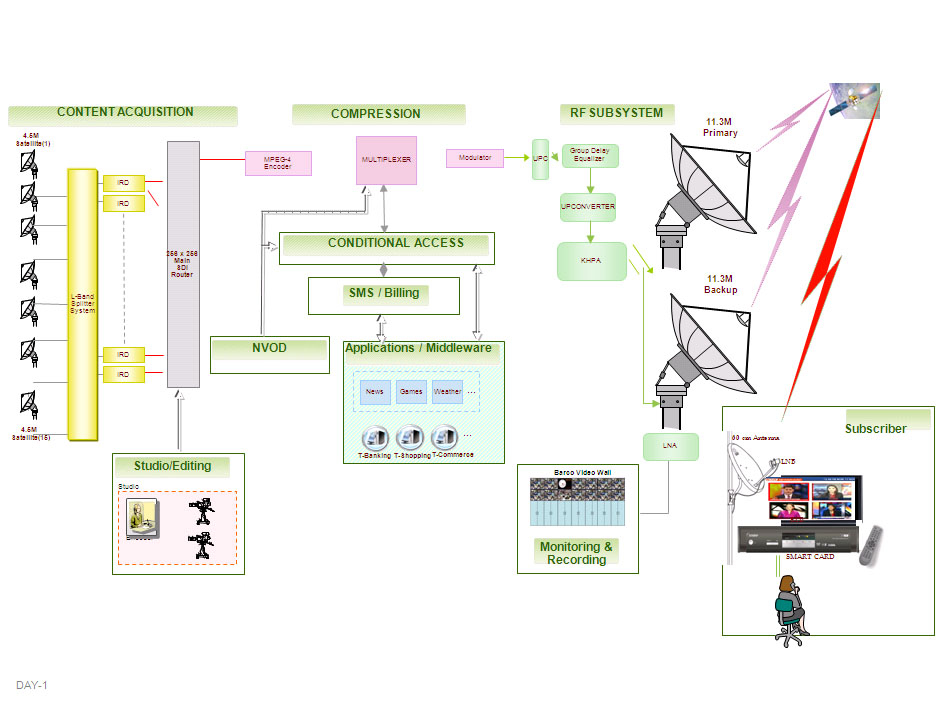
The RF subsystem contains the uplink facility that transmits the signals to the transponders in the satellite, which in turn relay the signals back to the subscribers’ dishes. The devices here perform the last stage of processing of the signals in the system before they are finally sent for up linking.

* Group Delay Equalizer
* UP Converter
* LNA (Low Noise Amplifier)
* Uplink Antennae

1. *Network Monitoring System:*

Monitoring is required to analyze the working of the system & all its components to optimize its performance. Testing is also an important process to improve the reliability of services and rectifying the errors.

* Monitoring Equipment
* NOC (Network Operation Center)
* DTH Test Lab

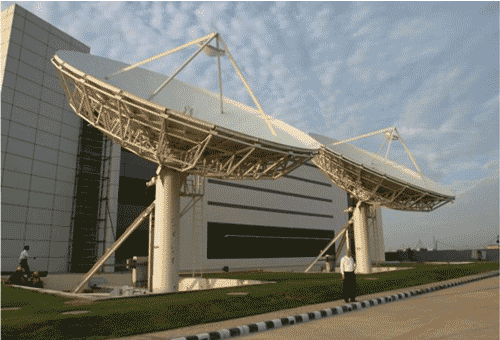


The Schematic diagram shows all the major stages involved in the DTH system. The data from the broadcasters enters the facility through the receiving antennae. The Head end sub-system begins decoding and processing the signals so that they can be further integrated with the software and applications. The final stage to processing is done in the RF sub-system where the signals are finally amplified and transmitted to the transponders through the uplink antennae. The whole system is constantly monitored for fast detection and correction of any problem and also to improve the performance of the system.

# **DTH: Head end Sub-system**

## **Introduction**

The head end or the front end system is the heart of the network and the source of all signals. A considerable amount of funds are invested in the Headend and the network owner needs to keep in mind both, his existing needs as well as project and consider his future requirements.



Front-end system consists of video and audio compression encoders, multiplexers and other components. The main task is to front-end system for digital TV signal coding, the use of statistical multiplexing technology in a limited frequency band to transmit more programs. The MPEG-2 compressed video and audio signals received from the broadcasters are converted to MPEG-4 which are further processed and integrated with the software and then sent to the RF sub-station for unlinking.

## **Network Elements**

**The headend facility comprises of two main systems –**

1. Content acquisition system
2. Compression system

***Content acquisition system:***

The content acquisition system is the where the data signals are received from the broadcaster and passed on for processing.

Video Router

IRD and L band Splitter

Receiving Antennae

*Receiving antennae:*

The receiving antennae at the headend facility acquire the data transmitted by the broadcaster in the L band frequency.

The Airtel DTH uplink facility at Manesar has a number of 4.5m dishes for receiving signals. The size of the receiving antennae varies as per the frequency band of transmission.

A Simulsat Antenna by Andrew/Prodelin was installed at the DR-facility at Bangalore to receive signals from various Broadcasters through single antenna.

*IRD:*

An integrated receiver/[decoder](http://decoder) (IRD) is an electronic [device](http://circuit) used to pick-up a radio-frequency signal and convert [digital](http://digital) information transmitted in it. The IRD is used for the reception of contribution feeds that are intended for re-broadcasting, and forms the interface between a receiving [satellite dish](http://dish) and the uplink infrastructure.

The Bangalore DR-Facility installed 20 Scientfic Atlanta PowervU IRD instruments to accommodate the channels as part of the Sony TV Package.

*Routers:*

Video Routers are used for transporting video signals from inputs to outputs. Routers are normally described by the number of their input to outputs e.g. 2x1, 256x256. Because any of the inputs can be routed to any output, the internal arrangement of the router is arranged as a number of crosspoints which can be activated to pass the corresponding signal to the desired output.

A the DR facility at Bangalore has a Leitch Platinim 256X256 SDI Router/Switch to route the incoming channels into the compression system.

***Compression System:***

The Compression system takes the signals from the content acquisition system and begins processing through various stages with the addition of the middleware and applications.

Modulator

MPEG-4 Encoder

Multiplexer

*MPEG-4 encoder:*

The data sent by the broadcaster is encoded in MPEG-2 format and is converted into the more efficient MPEG-4 format. For optimized use of broadcast channel it is necessary to reduce the amount of data that is necessary to transport specific information which is allowed through higher compression.

DTH applications do not normally worry about encoder/decoder latency, which is critically important for encoder performance.

SD Encoders - MPEG4 with VBR with IPTV License are installed at Bangalore for to Encode 150 channels with only 10 as redundant. Tandberg Audio Encoders are also present to process Audio channels.

*Multiplexer:*

The multiplexer in the DTH system plays the role of mixing all the incoming channels (not to be confused with TV channels) into a single signal at a particular frequency. Here, all the processing of the signal begins, with integration of all the software and applications that come as part of the DTH services.

*Modulator:*

Modulators essentially take an input signal and attach it to a specific frequency.Modulation is essential for transmission of two or more signals simultaneously. Modulation avoids any interference between the two signals and also ensures that signal errors are avoided during transmission. It entails the transformation of data using error correction and signal mapping to produce a digital carrier suitable for satellite transmission.

**Need and Type of Capex**

The headend is a master facility for receiving signals from the broadcaster for processing and distribution over the DTH system. As a vital element in the functioning of the DTH system, capital expenditure is made to upgrade the headend as per business requirements.

***Upgrade in Technical Equipment***

Capex is required for equipment & instruments to optimize the working of the system.

Installation of new 4 Port Quad L Band Passive Splitter, 12 port Active L band Splitter and L band line amplifiers with 4 amplifiers per chassis form Quintech was undertaken at the DR Headend at Bangalore for L Band Distribution.

Initial Investment includes -

**Cost of new component:**

5 Quintech L Band Line Amplifiers, 21 Quad L Band Passive & 50 12-port Active L band Splitters

**Additional equipment and Accessories:**

L band divider panels (24 Port), L Band Distribution Rack with Installation Material, F Type Connectors for RG 6 and RG 11 (Compressed)

**Peripherals and cabling:**

24 port L band patch & cables, co-axial cables for RG6 and RG11 connectors

**Installation and commissioning charges**

**Project Management Fee**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Description of Item | Part No & Make Name | Quantity | Category | Purpose |
| L band line amplifiers -non redundant. 4 amplifiers per chassis - | Quintech | 5 | Amplifier | for L Band Distribution |
| L band divider panels (24 Port) |  | 2 | Cables | for L Band Distribution |
| L band patch & cables (24 Port) |  | 2 | Cables | for L Band Distribution |
| 4 Port Quad L Band Passive Splitter | Quintech | 21 | Splitter | for L Band Distribution |
| Coaxial Cable RG 11 (KM) | Comscope/Beldan | 3 | Cables | for L Band Distribution |
| Coaxial Cable RG 6 (KM) | Comscope/Beldan | 4 | Cables | for L Band Distribution |
| L Band Distribution Rack with Installation Material | Misc | 1 | Peripherals | for L Band Distribution |
| F Type Connectors for RG 11 (Compressed) |  | 100 | Peripherals | for L Band Distribution |
| F Type Connectors for RG 6 (Compressed) |  | 500 | Peripherals | for L Band Distribution |
| 12 Port Active L-Band Splitter | Quintech | 50 | Splitter | for L Band Distribution |

***Utility Augmentation and Infrastructure Upgrade***

Capex is required for equipment & instruments to optimize the working of the system.

Installation of new equipment increased heat dissipation in the CAS room. With the current 3.8 TR precision AC proving insufficient, a new 6.5 TR PAC (precision air conditioner) was required to maintain the recommended temperature.

Initial Investment includes -

**Cost of infrastructure, Hardware & Maintenance:**

Precision Air Condition (25 Kw) with HSC, FSC, NIC card

**Additional Peripherals and Accessories:**

Refrigerant etc

**Piping and cabling:**

Copper piping electrical cabling and copper pipe insulation

**Installation and commissioning charges**

***New Revenue Opportunity***

Investment is required to undertake new projects and development to explore newer avenues to generate revenue and make the services that are attractive, robust and more than meet the expectation of end Customer.

Audience Measurement System (AMS) is an end-to-end system that enables DTH operator to measure subscriber-viewing behavior. AMS provides events information related to the whole TV viewing experience, including live viewing; recording, local playback, interactive applications messages, and reports the log events in a non-intrusive mode. The DTH headend was upgraded to support the Audience Measurement System (AMS), which is a functional set of EPG phase 3.0. AMS integration was undertaken by NDS, Airtel’s technology partner for EPG and CAS system

The cost involved in such an investment goes as follows –

**Cost of new components and hardware:**

iChannel (New Component)

AMS Proxy (New Component)

VG Console (Existing Component, Only upgrade)

EMMG (Existing Component, Only upgrade)

**Cost of Installation of hardware and software:**

Installation of new head end machines for AMS including: hardware, software and configuration

Modification of existing NOS Videoguard head end component configuration to support AMS and GSM functions

**Cost of Integration with the system:**

Integration with GSM Return Path Network

Integration with 3rd· party recipients of AMS Data

**Project Management Fee**

|  |  |  |
| --- | --- | --- |
| Product | Description | Quantity |
| VG(Modules) Broadcast Products: Web Servers | Third Party ·Software Clustering No NLB | 4 |
| Racks with a safe | Kappa rack 230V PDU Full Height Rack (420) | 1 |
| KVM + monitor |  | 1 |
| Blade Base Entry Crate | EMEA POUs 220vl | 1 |
| Blade Crate Extension (Full) |  | 1 |
| NDS Software | Software | 4 |
| Cisco switch | NDS has procured this for AMS project timelines | 2 |

***Investment to support growth***

A large scale capital expenditure may be required to enable the company to expand and bring about extensive changes in the system.

Up-gradation of headend Satellite migration: Migration to a new satellite SES-7 from INSAT 4CR was undertaken to meet business requirement. This was accompanied by Technical Infrastructure & Headend system up-gradation at Manesar for SES 7.

**Note:** Large scale projects undertaken by the company such as Satellite Migration involve heavy Capital Expenditure and Operational Expenditure covering a major part of the system and spanning over a number of years. Hence, its effect can be seen throughout the system.

The following table shows the cost of activities during migration to 2nd Satellite.

# **DTH: CAS and Middleware**

## **Introduction**

The CAS & middleware are installed in the system to integrate the essential software for the working of DTH services. During the processing of the signals, the services must be secured so that they are not vulnerable to illegal use. A number of applications and software must also be loaded that enable the customer to use the services through the STB (Set Top Box).

After the video is compressed and encoded, the data is encrypted it in order to keep people from accessing it for free. Encryption scrambles the digital data in such a way that it can be decrypted back to usable data, only if the receiver has the correct decoding satellite receiver with decryption algorithm and security keys.

The entire process can be broken down into the following –

1. Near Video on Demand (NVOD)
2. User Management System – Billing
3. Middleware – Applications
4. Conditional Access System (CAS)

## **Network Elements**

The Process of integration of the middleware and applications has 4 major components. These components integrate all the services into the system which can then be accessed by the user.

Conditional Access (CAS)

NVOD

User Management -Billing

Applications

*User Management System:*

The DTH user management system is the heart of the system, mainly to complete the following functions:

1. Registration and management of user information.
2. Buy and packaging programs.
3. The standards for the development program in mind and users fees.
4. Market Forecast and marketing.

User management System mainly consists of user information & the program information database management system and is equipped to answer the user’s queries and provide a variety of customer service Call Center composition.

*Billing Mechanism:*

The billing mechanism is programmed to lock all the program data and subsequently, allows users to view only those channels that they have subscribed for. The User management system must be secure to ensure that none of the services are being accessed illegally. For example, the programming algorithm in the Set top box is changed every 15 minutes to create an almost foolproof protection system.

*Conditional access system (CAS):*

Conditional access system has two main functions:

1. Encryption of program data.
2. User authorization.

The conditional access system (CAS) allows wide range of business models and provides flexibility to packages and marketing content.

Airtel DTH uses a conditional access system called ‘Videoguard’ manufactured by NDS.

***Software and Application:***

There are various applications and programs available -

1. The Electronic Program Guide: The EPG is an on-screen guide to scheduled broadcast television programs, allowing a viewer to navigate, select, and discover content by time, title, channel, genre, etc, by use of their remote control.
2. Teletext: Teletext offers a range of text-based information, typically including national, international and sporting news, weather and TV schedules.
3. Multilingual Audio and Subtitles: Audio Tracks and Subtitles in several languages are provided in selected channels for the user’s convenience.
4. Active services: These interactive applications are designed to enhance user experience. For example, some interactive services provide learning tools like puzzles and games for children.

***Development and introduction of new software:***

Airtel DTH has a number of services as part of its product development projects -

Mosaic:Mosaic Interactive application has multiple channels in one application thus saving bandwidth to accommodate more channels. The application provides the user with the option to watch 4 different channels in a very intuitive way.

USB Media for EPG features: This program aimed at arranging for quantities of certified USB-based Flash Drives & Hard Disks for implementing PVRLite & PDL-Lite features in the upcoming EPG Phase 3.5 for Airtel DTH platform.

Playout- DTH iMusic: Program was launched to integrate Audio channels with EPG or interactive music application.A 16 Channel analog stereo audio output from audio play-out Broadcast system would be integrated with the existing audio compression system of DTH.

***Video on Demand services:***

There are four major types of services that are Airtel:

Video on demand (VOD): systems allow users to select and watch video and clip content over a network as part of an interactive television system. Download and streaming video on demand systems provide the user with a large subset of VCR functionality including pause, fast forward, fast rewind, slow forward, slow rewind, jump to previous/future frame etc.

Near video on demand (NVOD): The service is a pay-per-view consumer video technique used by multi-channel broadcasters using high-bandwidth distribution mechanisms such as satellite and cable television. Multiple copies of a program are broadcast at short time intervals (typically 10–20 minutes) providing convenience for viewers, who can watch the program without needing to tune in at a scheduled point in time.

Push video on demand (Push VOD):The system features a Personal Video Recorder that automatically records a selection of programming, often transmitted in spare capacity over-night, for the user. The user can then watch the downloaded programming at a time of their choice.

Pay-per-view (PPV): This service allows television viewers to purchase events to be seen on TV and pay for the private telecast of that event to their homes. The event is shown at the same time to everyone ordering it, as opposed to video on demand systems, which allow viewers to see the event at any time. Events can be purchased using an on-screen guide, an automated telephone system, or through a live customer service representative.

## **Need and Type of Capex**

Conditional Access System (CAS) is used by all the DTH operators for secure broadcast of DTH services. The growing demands of media sector to have one stop shop for all services, make it is necessary to upgrade and expand our CAS services.

***To implement new CAS services***

New CAS services can be introduced to gain higher market share and create a USP in the segment.

Bharti Airtel Limited had a teleport facility in Noida with infrastructure only capable of supporting FTA channels. With growing demand, A CAS was required at the teleport end to support encrypted channel service as well. A 10 channel Conditional Access System was thus set up to address the needs of the media and entertainment industry, making the company the first to offer such a service.

Cost involved –

**Cost of hardware and equipment:**

Key server, DVB server, CAS server Hardware, Cisco Switches etc.

**Accessories and peripherals for new services:**

Racks, Cabling, Switches, Client PC’s etc.

**Installation and commissioning charges**

**License fee**

**Training charges**

|  |  |  |
| --- | --- | --- |
| Description | Details | Quantity |
| License fee | License fee for 0 to 99.999 subscribers | 1 |
| key server | Proprietary Hardware in redundant configuration | 2 |
| DVB streamer | Proprietary Hardware in redundant configuration | 2 |
| Hardware | 3rd party CAS Server hardware from IBM, Switches, OS, Storage, Cisco switches | 2 |
| Installation and training | Installation, Training and ATP | 1 |
| Accessories | Racks, Cabling, Client PC's | 1 |

***To upgrade existing services***

An upgrade may be needed in the present infrastructure to support a larger customer base, as well as to improve services to enhance user experience.

A DTH CAS Headend up gradation was undertaken to support upto 10 Mn subscribers as existing infrastructure could not expand beyond 5 Mn. The DVB-SI used by STB’s was upgraded to the Bandwidth saving MH.SI information system to allow additional channels or enrich existing EPG data.

The cost of upgrade includes –

**Cost of Hardware and software for upgrade:**

Channel Support Servers, Data Carousels, VG Cluster, Anti-Virus, Firewall

**Configuration and integration of instruments & services**

**Commissioning and Testing charges**

**Project management and training charges**

***Addition of new functionalities in the system***

Addition, Up-gradation and testing of new functionalities in the system is an ongoing process to improve services

Airtel uses Videoguard by NDS for its conditional access system. The NDS test System for Videoguard headend of DTH was implemented to enable testing of upgrades and new functionalities before putting on live system.

Costs Involved -

**Cost of new equipment:**

VG Cluster (security server base infra and boards)

VG Module (Webservers, ASI isStreamer)

**Add on products and other accessories:**

OIG (Optional Catoris), Synamedi8 XTV Encryptor, Synamedia XTVS (CAB/PAS), iSSH Boards

**Installation of software:**

VGH Management Client PC, Antivirus Enterprise Windows Clients

**Racking and peripherals:**

BackuPDiSkS, 1 Blade Base Entry Crate

**Project Management Fee**

|  |  |  |
| --- | --- | --- |
| Component | Sub-Component | Quantity |
| VGC(cluster) | VGC (cluster) | 1 |
|  | Security Server Base Infrastructure | 1 |
|  | Security Server Boards (with 24 chips) | 5 |
| VGM(modules) Broadcast Products | ASI iStreamer | 2 |
|  | Additional Servers (e.g for SIG. XSG.) | 1 |
|  | Secure Gateway (SGW) Webservers | 1 |
|  | Web Servers | 5 |
| VGM Add-on Products (VOD/IPTV) | OIG (optional Caloris) | 1 |
|  | Synamedia XTV Encrypter | 1 |
|  | Synamedia XTVS (CAB/PAS) | 1 |
|  | iSSH Boards (with 24 chips) | 1 |
| VGH Monitoring (Windows) | VGH Management Client PC | 2 |
|  | Antivirus Enterprise Windows Clients | 1 |
| Racking & Peripheral | Backup Disks | 14 |
|  | Blade Base Entry Crate | 1 |

***New projects and Initiatives***

New projects and development need to be undertaken to be at par with the competition. Rapid advancements in technology are taking place in this field and it necessary to deliver the best and most attractive services to the customers.

The mosaic application was developed by Airtel DTH in response to a similar application in Tata Sky and VideoconD2H. It aimed at giving customers access to new content which is not there on any other network, by offering multiple channels in one application thus saving bandwidth to accommodate more channels. Hence, it would get more subscribers which in turn would bring more Carriage and Subscriber Revenue.

Cost involved –

**Cost of Hardware and Installation:**

11 lakh per Mosaic generator and no additional encoders as each mosaic saves 1 encoder

**Application Development Cost:**

Development and deployment of iDD and iDivine Mosaic application of Bharti Airtel DTH services

**Project Management Fee**

# **DTH: RF Subsystem**

## **Introduction**

The RF subsystem contains the uplink facility that transmits the signals to the transponders in the satellite, which in turn relay the signals back to the subscribers’ dishes. The signals after passing through the encoder and multiplexer undergoing compression are sent to the modulator. The modulator provides a carrier signal and the modulated signal enters the sub-system for further processing.

The signals entering the sub-system are all at different phases and which may cause interference & may cancel each other out. Hence, the GDE (Group Delay Equalizer) brings all the signals to one common phase. These signals are then sent through the UP converter, which converts the current L band frequency signals to the Ku Band. This step is essential as signals at higher frequencies are efficiently transmitted over long distances to widely distributed centers (subscriber’s receiving dish). The system is also closely monitored by the NMS (Network Monitoring System) which checks for any losses in the quality of video or audio.

Finally, the signals are sent over to the uplink station, which contain LNA (Low Noise Amplifiers) which amplify the signals before transmission, to travel such great distances and still have adequate strength.

The facility houses giant antennae pointed directly at the satellite so that transmission to the transponders can take place at maximum signal strength.

## **Network Elements**

The RF sub-system is responsible for the final processing of the signals and transmission to the transponders. This system can be broken down to the following components.

Group Delay Equalizer & UPC

LNA

UP Converter

Up linking

Antennae

*Group delay equalizer:*

This instrument processes the [signal](http://processing) and performs delay equalization by adjusting the relative phases of different frequencies to achieve a constant [group delay](http://delay).

*Up converter:*

The Up converter is a device that takes an input of [radio frequency](http://frequency) energy of a specific [frequency](http://frequency) range and outputs it on a higher frequency. The frequency of the signals are in L band, which is efficient in transmitting large data to a single centre with large receiving dishes (the Headend facility) however as it is not possible to install such large dishes at the receiving consumer end, the signals need to be converted to the Ku band. These signals can now be transmitted to a large no. of smaller receiving antennae at the customer’s end.

The IF L band converter at the DR-Headend to provide the frequency in the test bed for testing

*Uplink Antennae:*

Uplink satellite dishes are very large in diameter resulting in more accurate aiming and increased signal strength at the satellite. The uplink dish is pointed toward a specific satellite and the uplinked signals are transmitted within a specific frequency range, so as to be received by one of the [transponders](http://transponder) tuned to that frequency range aboard that satellite.

The Airtel DTH facility at Manesar has large satellite dishes of 11.3m diameter for transmitting signals to the satellite transponders.

*LNA:*

The Low-noise amplifier (LNA) is an [electronic amplifier](http://amplifier) used to amplify the processed signals before they are transmitted to the customers. They are located very close to the uplink antennae to reduce losses in the [feedline](http://feedline).

## **Need and Type of Capex**

***Utility Infrastructure Augmentation***

Network infrastructure requires periodic maintenance and redevelopment to ensure proper working and availability of redundancy in the system enables a high network uptime.

The Bangalore HUB is a Category-A building being a complete technical zone with critical network infrastructure & NOC. With the infrastructure proving inadequate, an RF room with 2 UPS rooms and Panel expansion rooms was constructed to accommodate the RF Network systems of Second Satellite operations.

The costs involved are -

**Cost of new hardware and infrastructure:**

Construction and renovation of rooms to house equipment

**Cabling and Piping:**

Electrical cabling and Copper piping with insulation

**Installation charges**

***Technical upgrade and maintenance***

To provide better signal quality in an increasingly competitive market, up gradation and maintenance of the system is required to meet the delivery of the best quality RF carrier.

Periodic maintenance activities and upgrade are required to ensure proper working of the system.

The Manesar facility recently had various instruments & devices ordered as spares of critical parts to make sure that there is no degradation in the quality of services it provides and that system faults are fixed quickly to prevent a breakdown.

Initial Investment includes -

**Cost of new component:**

3 KHPA Blowers, 2 Quad L- Band Amplifiers, 1 Backup KHPA with DFTS etc

**Additional equipment and Accessories:**

Quad 4 way divider, Up-converter switch controller etc

**Peripherals and cabling:**

Racks, Connectors, cables etc

**Installation and commissioning charges (If Installed)**

**Project Management Fee**

|  |  |  |  |
| --- | --- | --- | --- |
| Equipment | Supplier | Quantity | Purpose |
| RPS (Redundant power supply) | Quintech | 1 | Required as Spares |
| LNA assembally | Miteq | 1 | Required as Spares |
| BDC | Miteq | 1 | Required as Spares |
| BDC switch controller | Miteq | 1 | Required as Spares |
| Upconvertor switch controller | Miteq | 1 | Required as Spares |
| Backup KHPA with DFTS | CPI | 1 | Required as Spares |
| KHPA Blower | CPI | 3 | Required as Spares |
| Rain Sensor & Blower | Viasat | 1 | Required as Spares |
| Quad Amplifier L- Band | Quintech | 2 | Required as Spares |
| Quad 4 way divider | Quintech | 2 | Required as Spares |
| 16X1 SWITCH MATRIX | Quintech | 1 | Required as Spares |
| 8X1 SYSTEM CONTROLLER | Quintech | 1 | Required as Spares |

***Expansion for new services***

Expansion in the system is needed to cope with Business requirements and growing i.e. Construction of additional infrastructure and installation of new equipment.

The migration to 2nd satellite SES-7 required major RF up gradation at the Bangalore diversity site. An up gradation of NOC was also undertaken to install equipment for monitoring of new NMS and SES carrier with additional channels.

# **DTH: The Monitoring and testing systems**

## **Introduction**

There are various stages in the signal processing that require monitoring to ensure that there is no loss in the quality of video or audio provided by the DTH services. Automated monitoring devices analyze the data transport stream for any losses. Monitoring allows rapid isolation and debugging to rectify system faults. The system also can compare and analyze measurements and results to correct any recurring problems.

## **Network Elements**

***Monitoring Equipment:***

Monitoring is critical to the system’s performance and various devices & instruments are placed for quality analysis over the entire system. There is a variety of monitoring equipment that is present at the DTH facility, for example -

1. BARCO monitoring equipment: The system is used by Airtel for 24X7 monitoring for loss of quality in audio and video signals at the DTH facility at Manesar.
2. Dolby Audio Analyzer: The analyzer ensures healthy transmission of the content by continuous real-time and post fault monitoring & analysis of services.
3. The DVB/MPEG Transport Stream analyzer: The automated system is used to monitor each uplink and downlink chain, giving detailed diagnosis and debugging capability to reduce error correction time.

***NOC (Network Operation Centre):***

The NOC (Network Operation Centre) is a facility from which control is exercised over the DTH Network. It is responsible for monitoring the network for alarms or certain conditions that may require special attention to avoid impact on the network's performance.

The NOC essentially consists of a giant [video wall](http://wall) showing details of highly significant alarms, ongoing incidents and general network performance. All the channels being broadcast by the Airtel DTH are displayed on here, so that they can be monitored and any glitch in the system can be easily indentified. Some parts are used for showing a news or weather channel so that the technicians are aware of current events which may have an impact on the network or any system.

The NOC at Manesar is has a giant video wall to monitor all the channels being provided by us, along with various instruments to analyze incoming video and audio stream, picture quality etc.

***DTH Test Lab:***

The DTH testing lab plays a vital role in the development of new services and feedback before implementing them in the real system. Testing is essential in order to furnish various tasks and testing procedures related to new product development, evaluation and analysis of field issues the equipment purchase is required.

It is important that field teams carry installation tools that are accurate, for reduced realignment and revisit calls, to ensure good signal reception at the time of installation at customer premises.

Benchmarking with current market trends and products is also necessary to compare and ensure that similar problems are corrected without much delay.

Testing is also required in new product development and addition of new features and products for Airtel DTH customers.

This stage is in direct relation to in-house activities related to customer satisfaction aimed to reduce product failure and issues.

Airtel DTH has an automation testing system for STB in simulated environment. The system also includes a Broadcast Test System and Software Tools for analysis. It is used for automated testing of EPG, iTV application and games. This system has prominent features like:

1. Application & Games testing simulation.
2. Real time TV and audio broadcasting signal generation
3. Transmission and interferer simulations.

## **Need and Type of Capex**

Investment in new monitoring equipment is driven by the need to bring the most advanced technology and innovation to the consumers. With the addition of millions of subscribers every year, the companies must expand & deliver services at the highest level. It is thus essential to monitor and analyze any problem in the network. This helps to achieve increased customer satisfaction and readies us for future evolution.

***Investment to increase capacity***

New equipment may be required when the existing infrastructure does not have the capacity for additional services.

The broadcast facility at Manesar provided uplink for 198 SD, 1HD and 4PPV channels. However, with plans to launch 20SD and 5HD channels the following year, it was seen that the present multiviewer card based monitoring system could not accommodate any additional services. Hence, new BARCO Monitoring Equipment was installed to check for quality and losses at each stage in any service, 24X7.

The cost of capacity upgrade includes –

**The cost of Cost of additional equipment:**

GDAC, Audio & Video cards

**Additional accessories and components:**

Composite ANA video A-D Converter, G-link to DVI converter

**Project management fee**

|  |  |  |  |
| --- | --- | --- | --- |
| Description | Supplier | Model | Quantity |
| GDAC | Evertz | 2430 GDAC | 7 |
| I/P Card Audio | Evertz | Audio 3000MVP | 1 |
| I/P Card Video | Evertz | 3001 MVP | 5 |
| Display Card O/P | Evertz | 3000MVP | 1 |

***Upgrade to improve and optimize performance in the system***

The expansion process of satellite capacity on SES-7 with 11 transponders needed installation of Spectrum analyzer to monitor and analyze the receive carrier of DTH services.

The costs for a technical upgrade include –

**Cost of new equipment and hardware:**

Spectrum Analyzer, Antenna control unit, Dual band block down converter etc

**Peripherals and Accessories:**

Racks, Panels, connecters, Brackets etc

**Installation and commissioning charges**

|  |  |  |
| --- | --- | --- |
| Description | Supplier | Quantity |
| Full wired equipment rack | GSI | 1 |
| Upgrade to operate from 13.75 -14.8 GHz | GSI | 1 |
| 1:2 Ku band LNA subsystem | Miteq | 1 |
| Tracking receiver | GSI | 2 |
| Dual band block down converter (10.7 to 12.75 GHz) to L band | Miteq | 3 |
| 2 way RF divider Panel | GSI | 1 |
| Misc: Cable connecters, Brackets etc | GSI | 1 |

***Testing at DTH Lab***

Improve services and reliability through testing and tracking the issues in software and applications.

A software-based issue tracking system called Bugzilla was required to replace the tedious and error prone manual tracking of issues using Microsoft Excel. The DTH network had 11 STB types and STB has multiple software releases in a year. Hence the software based tracker would generate reports, provide bug capturing details, release wise and STB wise issue status, with easy maintenance and no loss of issues.