

Advanced Satellite Communication Challenges, Advancement, Applications & Future Scopes

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Abstract - Correspondence in the entire of the World is upset with the coming of Satellites. Satellite Communication has served humankind from various perspectives for example to anticipate climate, storm cautioning, give wide scope of correspondence benefits in the field of handing-off TV programs, advanced information for a large number of business administrations and latest in communication and portable correspondence. It may not astonish world network, if satellite correspondence connections might be utilized for voice and fax transmission to Aircraft on International courses in not so distant future. GPS Navigation, Global communication, Multimedia video and web network, Earth Imaging through Remote detecting satellites for asset checking, Telemedicine, Tele-training administrations and so on are different quills in Satellite correspondence applications. Satellite correspondence framework has entered progress from point-to-point significant expense, high limit trunks correspondence to multipoint-to-multipoint correspondence with ease. Satellite Communication has moved in numerous means ahead like recurrence reuse, interconnecting many ground terminals spread over the world, idea of different spot shaft correspondences, Laser bar based correspondence through satellites and utilization of systems of little satellites in low earth circle. In this paper satellite correspondence progression, diverse application perspective present and future is talked about. Satellite correspondence has numerous application and market in the event that we can pool our assets, concoct inventive and ease answers for world network.

Keywords: Satellites, GPS Radio navigation System, Remote Sensing, Telemedicine, Frequency reuse, Networks of satellites.

I. INTRODUCTION

Satellite correspondence [1] administration industry has developed more quickly than was estimated in 1992. This development has been a worldwide wonder as the economies of the world have expanded and improved an extraordinary degree requiring expanded correspondence administrations for

both business and customer markets. With this expanded interest and ongoing huge, fast development of business, customer earthbound portable and web correspondence administrations has opened new open doors for satellite correspondence. Versatile and Internet transport get to organizations have invigorated the interest for new multi-state satellite star grouping to serve this market on both the national and worldwide scale. Development in the above territories combined with the worldwide increment in TV watcher ship and high information rate transport have been in charge of the ongoing and future foreseen development. There is likewise new interest for coordinated satellite, earthly correspondences that will empower the vehicle of data flawlessly over these vehicle media. These enormous and quickly developing satellite based business openings have pulled in the consideration of government and mechanical premiums of numerous nations and these countries are making critical speculations of new money to empower them to take an interest in this development showcase. Numerous nations have designated assets for satellite R&D activities to guarantee their long haul nearness in the business satellite industry.

The extension of satellites into new applications and the expanded worldwide interest for satellite correspondences administrations have pulled in the consideration of venture network. This has brought about the arrangement of new satellite specialist co-ops and invigorated mergers and acquisitions, the making of new organizations, the development of worldwide association and the privatization of in the past open satellite administration associations. The satellite correspondence industry has developed enormously and number of experts and scope of exercises have developed too [2]. Previously, business correspondence satellite assembling and specialist co-op associations would in general be preservationist and to be reluctant about embedding new innovation into satellites. This has changed in light of prompt need to serve clients blossoming interest for amusement programming TV, versatile interchanges and access to high transmission capacity Internet information.

Industry is embedding new innovation into satellites at fast pace. Late models incorporates locally available handling and exchanging, increasingly productive sunlight based cell,

higher power segments, progressively effective warmth scattering methods, electric-based station keeping engines, bury satellite connections, enormous radio wires, stage.

Increasingly, Satellite is no longer being viewed as a simple “bent pipe” but as an important component of a large global communications networking system, requiring interoperability between satellite and terrestrial communication components and thus compatible protocols and standards. This integration of satellites into the global network will require satellite industry to assume large software operations and develop new end- user services.

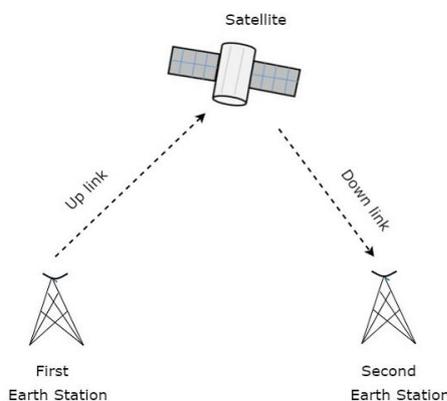


Figure 1: Basic Element of Satellite Communication

In this paper Section 2 depicts the component of satellite correspondence. Area 3 clarifies advances, issues and difficulties in satellite correspondence. Area 4 clarifies Applications. Segment 5 portrays future applications and area 6 toward the end.

II. ELEMENTS OF SATELLITE COMMUNICATION

Satellite communication has basic two elements [3] as shown in Fig.1 and Fig.2 general view: wider region, so that it may be received by many different customers processing compatible equipment. Another use of satellite is observation wherein satellite is equipped with cameras, various sensors and it merely downlinks any information it picks up from its vantage point.

The Ground segment

The earth stations are ground portion of satellite correspondence. Earth Station has two crease jobs. If there should be an occurrence of uplink or transmitting station earthly information as base band sign is gone through a baseband processor, an up converter, a powerful enhancer and through explanatory dish reception apparatus up to a circling satellite. If there should be an occurrence of down connection

or getting station the other way around occupation performed and at last changing over sign got through the illustrative reception apparatus to base band signal.

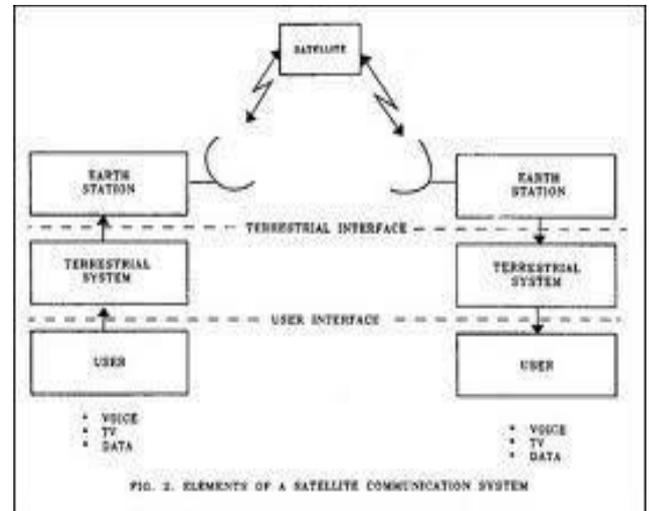


Figure 2: Satellite communication overview

III. SATELLITE COMMUNICATION, ADVANCEMENT AND ISSUES, CHALLENGES & FUTURE SCOPES

A) Advancement

Satellite industry has experienced sensational change since multi decade. There has been a virtual transformation altogether. Satellite itself is known as space fragment and contained complex structure. It has some significant subsystem like TTC framework, Transponder, Fuel Tank called engines tank, Antenna framework and Control framework and so on. Satellite transponder incorporates the getting radio wire to get signals from ground stations, an expansive band beneficiary, multiplexer and recurrence converter which is utilized to reroute they got flag through powerful speaker to downlink the ground stations. Satellite job is to transponders the gotten sign in other type of sign to be re-transmitted to ground stations.

For instance of transmission where TV projects are up-connected to satellite, satellite transponds it and down connected over a part of industry for example innovation, administrations, applications, money related, the board plans, arrangements and guidelines. In short worldwide upset in satellite correspondence has happened. The present greatest present concern isn't just innovation headway however approaches, norms and conventions, administrative choice, capital financing, exchange courses of action, new buyer arranged computerized market powers are overwhelming the bearing and speed of progress.

1) Fundamental Shift in Satellite Architecture, Applications and Markets

Application and administrations given by satellite correspondence has widened yet this isn't just reason of move of market that brings buyers and business all the more straightforwardly in contact with satellite specialist organization. Satellite administrations have been given to enormous organizations for the most part to media transmission bearers and the TV dissemination industry. Globalization and deregulation have enabled customary earthbound transporters to all the more intently grasp satellite innovation. This pattern of direct-to-the customer is seen in direct communicate frameworks (DBS), versatile correspondences satellite framework and now even in wide band, high information rate and sight and sound satellite frameworks. DBS frameworks are quickly expanding in worldwide scale. In Europe there are various territorial and national frameworks like Astra, British Sky Broadcasting (BskyB), EUTALSATs Hot Birds, TDF of France, TV sat of Germany and so on. In Asia there are Apstar, Asiasat, Indostar, Koreasat, Thaisat, India's INSAT and GSAT DTH, DBS and three Japanese direct-to-home (DTH) DBS frameworks and so on.

Some different associations likewise have adopted worldwide strategy. In the DBS radio circle there is Worldspace's Afristar, Asiastar and Caribstar. For worldwide TV there is Rupert Murdoch's driven trap of new DBS nets. There are obviously many national DTH frameworks around the globe that affirms the development and ubiquity of this new administration. This new pattern of a direct to purchaser satellite design is likewise reflected in the many versatile satellite frameworks also. These are a mix of navigational, informing and voice/information portable satellite frameworks. Most recently, nearly twenty new broadband sight and sound satellites filings from around the globe mirror the possibility that satellites can't seek last mile traffic with earthbound frameworks. These new frameworks which are to a great extent in the new Ka-band frequencies will work to ultra-little gap terminals (i.e.50 to 60 cm in measurement) and try to give a scope of advanced business administrations at focused information rates.

2) New Applications

Aggressive market, new open exchange arrangements and new advancements have served to make new and noted market opportunity. New applications and administrations especially Internet clients, and corporate Intranet, with their push for media applications at high information rates are driving up the interest bend pointedly. Fig.3 demonstrates the move in worldwide broadcast communications from voice-headed to

video and information driven. In like manner machine-to-machine correspondences are raising pointedly as by and large level of human-to-human media communications decreases. Computerized video channels particularly MPEG2 framework, Internet and Intranet applications are rising pointedly around the globe and speak to market increment. There are likewise rising applications, for example, cooperative figuring, disseminated CAD/CAM, logical representation, remote detecting information hand-off, informing and navigational administrations, electronic distributing and others that make the interest of new broadcast communications systems.

3) Common Service Platforms

The widening of sort of satellite administrations that can be given from space once served to make a few new groups of satellites. Each of these has been apportioned explicit recurrence band by International Telecommunication Union (ITU, for example, fixed satellite administrations (FSS), Broadcast Satellite administrations (BSS), satellite systems for land, aeronautical and oceanic portable satellite administrations (MSS). For quite a while period, as appeared in Fig.4, these groups of satellite could be mapped as far as used power. In present progressed logical days, another multi-reason satellites fit for giving practically all types of advanced satellite administrations from an expansive band and high control regular stage are beginning to develop. In an advanced framework where administrations are characterized by throughput rate and the size of handsets, the point of view is progressively getting to be "a bit is a bit regardless of the service delivered."

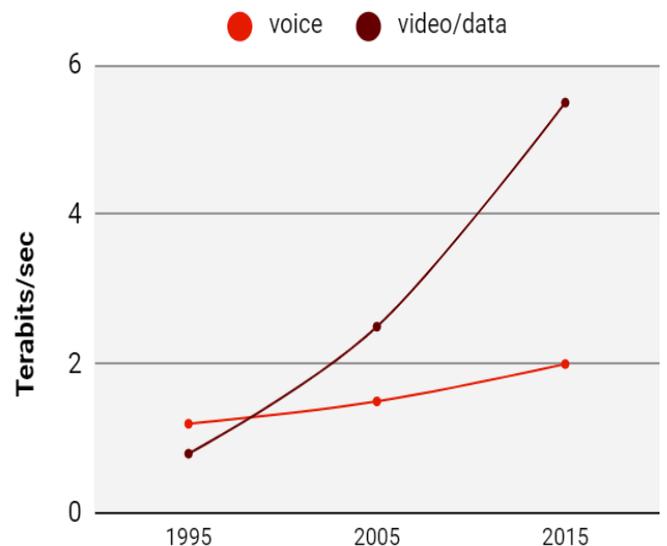


Figure 3: The shift from voice to data and video

4) New Architecture that provides services Direct to consumers

Satellites have been used to essentially for the vehicle of pitiful annihilation traffic and course of TV to connection head terminations and frameworks auxiliaries. This is a direct result of the limit of one satellite arranged at GEO explicitly to give correspondence congruity over 33% of the globe. In the past customers of satellite master associations have would all in all be enormous associations, the media transmission bearers and TV program traders. A vital change is bouncing out at consolidate the end client in this customer mix with Direct to Home (DTH), Direct Broadcast Service (DBS), Mobile correspondence and Internet access as a basic organization.

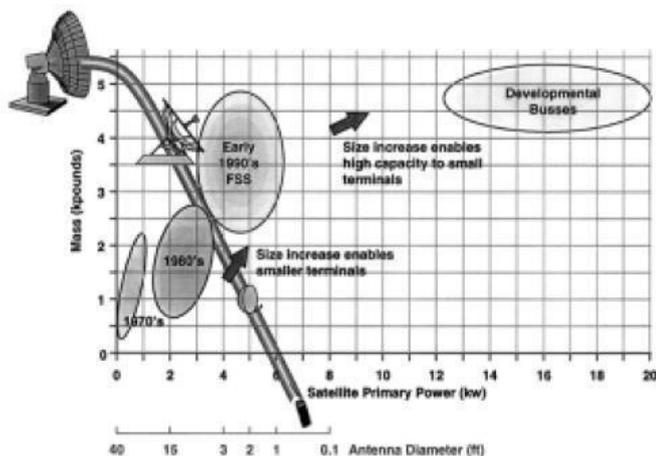


Figure 4: Satellite power/mass and terminal receiving wire size patterns

This change is quickening because of the inclusion of new innovation onto satellites like expanded power, staged cluster receiving wire, enormous width reception apparatuses, multi spot-shaft radio wires and locally available handling and exchanging. This change enables satellites to be financially savvy contender to digital TV, cell communication and high data transfer capacity Internet specialist co-ops in numerous pieces of the world. The as of late proposed satellite high information rate Internet administrations are targeting moving objective as the earthly system is grasping new innovation at a great rate.

5) Induction of new players in satellite communication market

A few new nations like Brazil, China, India, Israel, Korea, Spain and a resurgent Russia, all of which have explicit new gets ready for 21st century space broadcast communications have entered as new players in satellite correspondence showcase. The satellite business is presently populated by other new players like Motorola, Raytheon, Loral, Orbcomm,

General Electric, Boeing, Lockheed Martin, Matra Marconi, Alcatel, Alenia, Teledesic, Morningstar, Network 28, Visionstar, Echostar, Apstar, Worldspace, Afro-Asia Communication Ltd of India, Thuraya Satellite Telecommunication of Abu Dhabi and so on who have built up organizations, since quite a while ago associated with providing gear. Notwithstanding change driven by new innovation and anticipated market development for sight and sound satellite administrations new example of acquisitions, mergers and organization has advanced generally inside national markets just as new multi-billion dollar satellite undertaking that include new worldwide association as if there should arise an occurrence of Lockheed Martin framing solid collusion in Russia and Motorola partnership with Marconi. These progressions have been driven by quickly rising interest for new kinds of administrations particularly those identified with direct to home video, Internet and Intranet administrations including media necessities of business.

B) Issues and Challenges

1) New paradigm for satellite design, prototyping and manufacturing

Satellite assembling conventional example of profoundly specific, altered, planned and constructed a couple at a time is currently evolving. More accentuation is put now on the utilization of basic transport and utilization of CAD devices to redo the correspondences payloads. Mass delivered framework is embraced and numerous satellites are created without a moment's delay in a mechanical production system condition. Joining and testing is profoundly mechanized. The degree and nature of testing is decreased in the wake of prototyping and introductory generation is practiced.

2) New High Powered Platform

One of the key specialized patterns in light of the sending of LEO and MEO satellites has been the structure of huge gap GEO framework with high control framework. Prior business satellite power age was restricted to 7 to 12 KW. Be that as it may, new age fashioners have started to talk about enormous adaptable of floppy sun based cluster creating 50-60 KW. Likewise escalated endeavors are in progress to improve sun oriented cell execution by utilizing gallium arsenide/germanium, multi-intersection cells with guarantee of sun powered cell efficiencies above 30%. There are parallel endeavors to improve battery for example lithium particle and energy component innovation so as to create ever more elevated controlled satellites.

3) Critical Future Technologies

Basic innovations for future satellite interchanges are:

- Batteries
- Gadgets and structures for Phased
- Cluster and Multiple spot shaft radio wires on the ground and in space
- Powers and burning structures for dispatch vehicles
- High recurrence (frequency>20GHz) gadgets
- Materials for hardware gadgets
- Sun powered cell materials and structures
- System innovation for high information rate, incorporated space and earthbound frameworks
- Optical parts and subsystems
- Radiation safe gadget structures and circuits
- Solid and light-weight material
- Warm dissemination materials

Also trial satellites are required that can be utilized to test out new innovation that can only with significant effort be tried on the ground. At the framework level, the eventual fate of satellites could likewise be affected by high elevation, long perseverance stages which would work from 65,000 to 1,00,000 feet, for example, carriers and dallying air ship. Satellite correspondence in territorial applications or could be utilized related to satellites as a framework limit multiplier over populated territories.

4) Policies and Regulatory Issues

In universal satellite exchange landing rights understandings, yearly authorizing expenses for terminals, non-levy hindrances, assignment of frequencies and orbital spaces, sufficiency and adequacy of intersystem coordination method, security and protection of data being transferred on satellite framework and so on are a few issues to be settled. Most significant of all is the need to create conventions for consistent interconnection of satellite, remote and earthbound fiber systems. In the 21st century between associations of satellite frameworks, especially between satellite connections will be a key test. Interfacing them to low idleness earthbound system is genuinely a test.

C) Applications

Satellites are exceptionally appropriate for certain applications. These incorporate telecom, administration to portable clients including ships, airplane, land versatile and crisis benefits and giving about moment foundation in underserved regions. A critical factor in these plans has been the development of the Internet which gives no indication of lessening, regardless of the poor access that most clients as of

now appreciate. In this way the handling of a portion of these Ka-band frameworks could survive, "the last mile connection" issue experienced in most created nations. This would be significant application already not served by satellites framework. Other applications are:

1) Traditional Telecommunication

Media transmission pattern that are fuelling enthusiasm for satellite frameworks are immediate to-home TV (DTH) or direct communicate satellite (DBS), the gigantic development in remote hand - held telephone use (cell, individual correspondence administrations and paging) and the development in the quantity of PC on the planet, expanding quantities of which are sight and sound prepared and are being utilized to interconnect with Internet, sea and aeronautical communication, armada communicate correspondence and so on.

2) Air, Maritime and Earthbound Perception using Satellites

i) Air Perception

Meteorological satellites of significant space bearing nations working in the district are utilized to gather environmental information utilized in atmosphere estimate. India's INSAT-3 arrangement, MATSAT, China's Feng Yung-1C, European meteorological satellite NOAA arrangement and so forth are operational for this sort of uses.

ii) Maritime Perception

Wind speed and heading close the ocean's surface are imperative to estimate maritime tempest. India's Oceansat-1 and Oceansat-2, QuikSat of China, KOMPSAT for estimating sea shading, Envisat to quantify color focuses, suspended dregs and disintegrated natural issues are operational satellites for the maritime perception reason.

iii) Earthbound observation

Earthbound perception is helped through remote detecting satellite incorporate harvest the executives, fruitfulness, irritation and infection data to build yield yields and productivity, flood conjecture, ranger service estimation, worldwide change considers, land spread checking and evaluation, enormous region mapping, cartography, search and salvage activity, crisis fiasco correspondence and danger relief, perception of ecological change happening over land and so forth. India have Resourcesat group of stars of four satellite, Landsat-7 of NASA, ALOS, IKONOS-2, Quickbird1, Orbview-3&4 and so forth satellites are giving earthbound perception need.

3) Satellite based route and situating

SPS satellites will produce propelled applications that require exceptionally exact area and following, for example, accuracy mapping and looking over or following oil slicks and risky chunks of ice. What's more similar satellites will give propelled administrations to flying machine and vessel route and moving-map shows for engine vehicles. NAVSTAR and GLONASS star groupings, GNSS-1 satellite are supporting this reason.

4) Space Science and solar terrestrial applications

i) Space science application

With the development of the International Space Station now under way, another entryway has opened not exclusively to long length assessment of the space condition yet in addition to research and assembling exercises under microgravity conditions. Mir Space Station, the International Space Station will set up a further developed stage to direct space science and innovation tests.

ii) Sun based – earthbound applications

A few nations are researching the idea of sun based power from space. The Solar Power framework 2000 task would include electrical power age from sun powered cells on board satellites in low, tropical circles for transmission by microwave to extraordinarily planned power getting radio wires in nations lying the central zone.

5) Satellite-based instruction and preparing

i) Distance learning and educating

South-East Asian Ministries of Education association have executed open learning and separation instruction programs in their nations by means of satellite-based training and preparing in disciplinary open learning focuses situated in different nations in the locale. PEACESAT and other comparable satellites are utilized in Asia and Pacific district for instruction and preparing.

ii) Engineering Research and Development

At any rate nine nations are seeking after little scale exploratory missions that have the goals of human asset and industry advancement. These incorporate Badr-B, FedSat, TMSat and KITSAT arrangement.

6) Military application

Space assumes an expanding job in military exercises. They are broadly used to offer help for military or security

related exercises, for example, checking consistence with arms control bargains. Military uses incorporate symbolism, route, signal knowledge, media communications, early cautioning and metrology. There are more than 270 military satellites just as ~600 common, business and multipurpose satellites. These satellites serve military just as common applications.

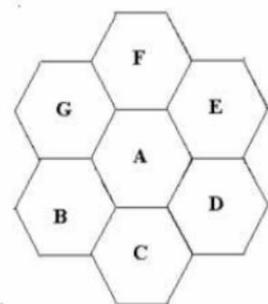
D) Future Applications & Future Scopes

1) Recurrence reuses application

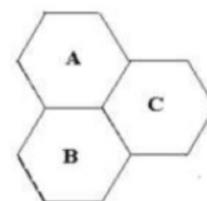
Since Satellite system serve huge zones for example, nations or mainland, an enormous number of pillars need to share the accessible shaft width. To dodge this recurrence reuse [4] plan is regularly used. This depends on reusing similar frequencies in spatially secluded pillars. Accordingly accessible transfer speed is partitioned into more modest number of pillars in inclusion region. The arrangement of bars that offer the complete accessible transmission capacity is known as group. The group is then rehashed in the inclusion region depending on the way that the pillars working at same data transfer capacity will be isolated from one another adequately so they don't meddle with one another. There are just a discrete arrangement of conceivable bunch sizes, N, to oblige a touching inclusion of hexagonal geometry. The conceivable number of bars in group which would frame decorating shape is given by:

$$N = i^2 + j^2 + i \times j \dots\dots\dots (1)$$

Where N is the number of beams in cluster and i, j are non-negative integer numbers.



N = 7



N = 3

Figure 5: Different cluster for hexa lattice

2) Utilization of spot beam concept and its applications

NASA's satellite ACTS uses jumping spot beam procedure to consolidate the benefit of recurrence reuse, spot shafts and TDMA. Idea of numerous spot shafts is additionally arranged in future age satellite of Italy, Italsat with six spot beams working at 30GHz uplink and 20GHz downlink, the satellite interconnects TDMA transmissions between ground station in all the major financial focuses of Italy.

3) Different applications

- Laser beams based satellite correspondence
- In discovering Space garbage arrangement
- Space Situational Awareness employments
- Utilization of group of stars of rocket and bury satellite connections for media transmission reason and so forth

4) Future scopes

- Normally, versatile interchanges flop over a huge region on the grounds that the shafts are harmed. That is the reason during debacles, salvage administrations go to their own correspondences innovation – for the most part over satellite frameworks. Information or telephone calls are sent straightforwardly to a satellite in space and, from that point, to accepting stations on Earth. Subsequently, the salvage laborers are not reliant on the interchanges framework on the ground.
- During storms, rather than TV client's satellite picture deteriorating gradually, rather it just vanishes all of a sudden. As it were, satellite correspondence has so far been inadequate with regards to a constant innovation that controls the association quality (like the Internet) and adjusts to the present use of the information line.
- The information preparing have been changed with the goal that the information rate changes relying upon the circumstance. For this reason, a unique modem has been produced for the transmission of the information.
- Rescuers later on will have the option to send recordings of the nearby circumstance and maps rapidly, and without the association severing, and even clear satellite phone calls without dropouts will be conceivable.

IV. CONCLUSIONS

In this paper satellite correspondence, its constituent's, headway in the satellite correspondence, present and future

applications are concisely discussed. It is a solitary endeavor to bring brief sketch about satellite communication applications. A detailed study of utilizations is still to complete at length. Details study of recurrence reuse in satellite and mobile cellular is matter of research in our future works.

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