Advanced Satellite Communication Systems & Services

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Since last decade the satellite industry is experiencing growth in advances of satellites in navigation and telecommunications industry. A range of future broadband, navigation, communication and earth observation services are being developed using next generation system architectures transforming the satellite communication and navigation networks for this century and beyond. These various services as shown in Fig. 1 include the following key characteristics:

1. Banking & Retail (Credit authorization of sale, Pricing updates)
2. Transpiration (Inventory control, Fleet management)
3. Entertainment (Video, audio, games, Interactive data)
4. Financial (Brokerage service Electronic payment transactions)
5. Energy (Pipeline monitoring, Power line monitoring)
6. Navigation Services (Navigation, Audio, video, data signals)
7. Telemedicine (Patient evaluation/treatment)
8. Internet (Streaming video, audio & data)
9. Earth Environment (Water and atmospheric Temperatures, weather, ocean changes)
10. Home Security & Information transfer (Audio, video, data)

The next generation system architecture apply advanced techniques in Network operational flexibility (consolidation, diversity, back-up), Global connectivity for symmetrical and asymmetrical applications with low operational cost, System management Flexibility with manageable complexity and Multicast mobility management, Use Networks of Networks, On-demand bandwidth capabilities with Integrated customer infrastructure, Guarantee end-to-end quality of service (premium customers), Multipoint-to-multipoint Internet and broadcasting capability, Backward compatibility/seamless integration into existing protocols and infrastructures (Enhanced TCP, IP routing and ATM switching) and Multicasting using Satellite Multicast Adaptation Protocol (SMAP).

The system architecture is defined using the following key design drivers:

***Satellite Payloads**

Satellite orbital locations (LEO/MEO/HEO/GEO)
High Powered Satellite Buses

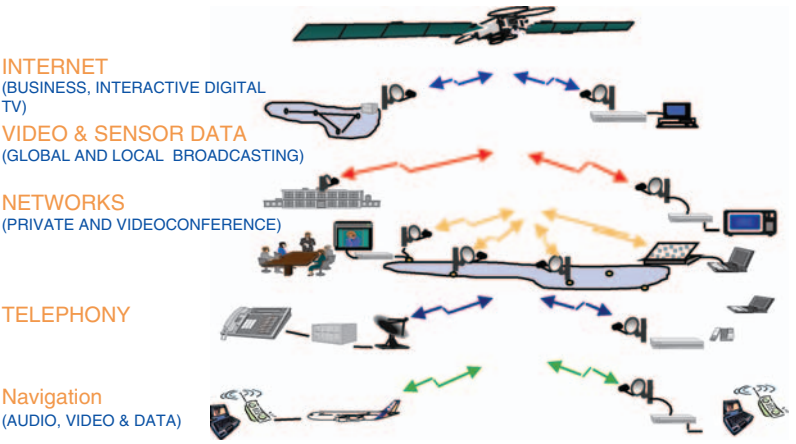

Fig. 1. Advanced satellite systems networks.

Onboard Digital Baseband Processors
Onboard Packet & Beam switching
Progressive Payload
Standard Interfaces

***Satellite Antenna**
Gimbaled Multibeam Antenna
Large Deployable Mesh Antenna
High gain phased arrays Antenna

***Communication Links**
RF & Optical Inter Satellite links
Uplink Power Mitigation techniques
L/S/Ku/Ka Band Up & Down links
Band Efficient Modulation

***Ground Network & Terminals**
Software Defined Radios
Advanced IC/DSP
Intelligent network architectures
Low cost ground terminals
Multi satellite link terminals

***Satellite Platforms**
A new generation of high-speed onboard digital payload processors and high-gain broadband antennas are emerging for either replacing the legacy systems. The major enhancement areas for next generation platforms are:

OBP with multi-satellite accessing, traffic aggregation and routing using inter-satellite links (RF, laser).
On-demand Satellite resource allocation with guarantee end-to-end service quality.
Satellite capability growth for future customer needs.
Progressive Payloads Configurations.

***Satellite transmissions/Antenna**

Network of Networks Architectures using mesh connectivity
Multimedia service enabling networking for dynamic on demand traffic needs
Wide, tailored, land mass coverage with on-orbit flexibility (Regional/local)
Adaptive beam forming and shaped beam antenna (dual polarization)
Efficiency transmissions (coding, packet, cell switching, reduced delays)
Secure Higher Capacity satellite network for open air interfaces/Internet "threats".
Manage core congestion for Internet traffic with flexible bandwidth control.

These advanced systems focus on enhancing the broadband satellite network capacity, billable bits and Quality of Service (QoS) to provide cost effective systems. The system design flexibility is further enhanced by using progressive satellite concepts for enhanced future customer requirement with new technologies. Progressive Supplemental Satellite Provide Cost Effective

System Capability For Future Customer Needs The major features advantages of this concept are:

***Progressive Supplemental satellite features**

Satellite designed to meet changed customer service requirements
Original satellite is designed with the interface to connect with the smaller satellite at a later date
Progressive satellite is connected to original satellite through pre defined Inter satellite link via a pre designed interface
Satellite uses advanced available satellite technologies at launch time
Provides use or future satellite technologies to meet new customer services by sharing the original satellite payloads

***Progressive satellite advantages**

Allows Multimedia satellite System to be upgraded for meeting the new customer service requirements, connectivity and capacity
Advanced new cost effective technologies are used for meeting new system needs after the original satellite launch

This workshop session presentation focuses in the key areas for next generation satellite system and services. In particular papers are presented in the areas of satellite accessing and resources allocation, Integration of Navigation and Communication services, Satellite Terminals Reconfiguration flexibility, Broad Band Mobile terminals, Broadcasting and Telemedicine services

References

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