Satellite Communication
While the world has made many firsts with satellites, satellite handheld terminals have evolved from being chunky and laptop-sized to becoming sleek and smart devices. These devices are not exclusive to governments, marines and emergency services anymore but are available to the casual user for business or safety purposes.

Unlike terrestrial handsets, satellite phones cater to a niche and exclusive market. With low demand volumes, semiconductor companies as well as terrestrial networks do not invest heavily in satellite communication.

**Challenges in Satellite Communication**

**Technology**
- Choosing technologies that consume less bandwidth and give more data rate

**Security**
- Longer cycle to realize ROI as huge investments are needed to provide cutting edge technologies

**Volume**
- Very low production volumes, Tier-1 semiconductor company do not invest in low volumes

**Cost & Durability**
- Expectation of long life of device (4-6 years) with ruggedness and less cost for service.
- Longer cycle to realize ROI on large investments made
Ensuring Reliable Connectivity

Sasken brings over two decades of terrestrial communication experience from ADSL technologies to latest LTE technologies. Sasken has executed full product program R&D for 15 mobile handset products with conceptualization, integration, productization, and production ramp up. Sasken has done R&D for several satellite phones, handheld as well as vehicle electronic devices such as PMR radios, smart antennas, and solutions for military devices. We combine our terrestrial IPs to build end-to-end customized solutions for satellite terminal manufacturers across the world. From complete terminal development to building large scale enterprise applications, terminal applications, sustenance and enhancement of software components, and addressing obsolescence, we have helped industry leaders launch next generation products with development cycles being less than 24 months.

Sasken Offerings in SatCom

- Satellite Terminal Development
- Access Network Enhancement & Maintenance
- Control Room Application, Network Management Application for mobile, Tabs, Desktops, Web based

Services offered

- End-to-End Product Development
- Enterprise Application Development
- Application Framework Development
- 3GPP/Proprietary Protocol Software Development
- Software maintenance Development
- Debugging
- Logger Framework Development
- Inspection tools development
- Terminal testing
- Network testing
- Application testing
- Integration and System testing
- Field Testing
Satellite Terminal Development

The wide acceptance of smart phones, dramatic improvements in user experience and access to large app stores have significantly influenced the design and development of handheld satellite terminals. Sasken complements satellite terminal manufacturers by bringing the critical know-how required to offer significantly smaller form factor, state-of-the-art antenna design, and evolved user experience.

**Hardware:**
- User interface
- Industrial design
- Mechanical engineering
- PCB layout design
- Hardware testing

**Electronics systems design:**
- Embedded Electronics
- RF
- Audio Simulation
- Design
- Integration and verification.

**Antenna:**
- Antenna simulations and design
- Multi-radio integration & signal integrity

**Protocol & Middleware:**
- Sasken Application Framework with features such as SMS, Dialer, Contacts, SMS2email, eCompass
- 3GPP/Proprietary Protocol Software Development
- Supplementary services applications for satellite handheld phones
- Cross platform abstraction layer to support different OS
- Android OS support
Sasken designs core modules that can fit into a small space, almost like a general credit card form factor, with high density RF integration. Comparison of Sasken design with another product in market shows that Sasken design uses only 75% of PCB area of other design and uses single PCB approach while some other companies use more complicated three PCB approach.

**Advantages**

- Customer can invest only on one core module development for many product lines
- Core module is re-used to develop different products in verticals
  - Handheld
  - Fixed
  - Wi-Fi Hotspot
  - Vehicular
  - Maritime
  - Aero
  - M2M
- Common Software and Hardware reference base
  - Less resources, less management effort, less maintenance, less cost, single test solution, easy certification and approvals, easy ownership transfer from vendor to customer
- Along with core module development, Sasken designs and develops RF front-end and antenna for each of the end products/terminals
Access Network Enhancement and Maintenance

On the Access Network front for Satellite Communication, Sasken specializes in product life cycle management that includes proof-of-concept, prototyping, development, maintenance and sustenance. Sasken has delivered excellence in specification, architecture, design, implementation and testing in the development cycle. Sasken has been serving Top 5 NEMs globally across 2G/3G/4G/CDMA, in software development, testing and sustenance of their network products for over 20+ Years. We have also displayed proven capabilities in using Sasken IP innovatively to enhance customers’ test outcome (UE Stacks, eNode Stack, EPC Simulator)

Technologies
- LTE/LTE A
- WCDMA: FDD, TDD, TDD LCR, HSDPA, HSUPA
- TDMA: GSM, GSM-R, GPRS, EDGE
- CDMA: IS-95, 1x-RTT, 1x-EVDO
  Rev A, Rev B, WiMax

RAN Products
- Base stations: BTS, Node-B - Pico, Micro, Macro, Femto, eNode-B
- Controllers: BSC, PCU, RNC, Femto Gateway, IP-RAN
- Management: OMC-R, OMC-B, NMS

Product Components
- Applications: Call processing, OAM agent, Features
- Traffic: Packet processing, Codecs
- Protocol stack: L1/Baseband, L2, L3 - Signaling, User plane, Transport
- Platform: BSP, Hardware abstraction, OS abstraction, Middleware
- Tools: Protocol Analyzers, Network Simulators, Traffic generators, RF Tools
Application Development

Sasken has extensive expertise in building enterprise applications that are capable of configuring various parameters to optimize the network behavior like network management systems, provisioning systems and web based reporting tools with alarms. These applications are built using service oriented architecture. Sasken has built applications on handheld terminals that have very low memory footprint and use less CPU cycles.

Sasken's Application Expertise

- Enterprise applications built using C#, .NET, WPF, WCF, NHibernate and SQL
- Used Qt for both device and application specifics
- Cross platform Terminal/handset simulator developments for easy testing and automation testing
- PC suite development, complete GUI and framework, for Satellite Phones for services usage and testing
- GUI development using QML Qt creator, Qt widgets, Qt quick and Qt Webkit
  - Debug tools, Firmware upgrade tools, Configuration tools, Logging tool, Monitoring tool
- Qt features used across different programs
  - Graphics visual types, animation, layouts, scalability for size, aspect ratio, orientation, density, style, and theme
  - Menu/status bar, control box, navigations
  - All types of widgets
  - Extensively used the internationalization and translation
  - Satellite phones and public safety phones are in use across globe

Technology Expertise

- C++
- C#
- SQL Server
- Linux
- Python
- Java
- Windows
- Android
- Qt
- Internet Explorer
Longest battery life in competition for the Inmarsat Isatphone Pro

Customer

» Inmarsat

Problem Statement

» To design and develop the satellite phone complying to GSM and GMR2+ specs

Solution

» Concept analysis, System Design
» HW and SW Design and Implementation
» Electro mechanics engineering, DFM & product validation verification.
» Schematics and PCB layout design.
» GSM/GMR2+ modem, transceivers, SAF, GPS, BT, USB
» SW tools - DFU, Production testing, Logging
» Acceptance, IOT
» 0-serie prototype manufacturing and verification.
» Manufacturing rampup support and documentation.

Key Contribution

» RF/BB design and PV. Mechanics and PCB layout design. Build support and type approval consultation

Value additions

» Low foot print modem and application framework
» Longest battery in Competition
» Low cost ruggedized stable design with IP54 ratings

Key Challenges

» Multi site development
» Power management, Excellent call quality
Inmarsat Isatphone2 loaded with Location Tracking, SOS assistance, and eCompass features

Customer
- Inmarsat

Problem Statement
- New generation of satellite phone with additional features

Solution
- New ID and mechanics with ratings of IP65 and IK04
- Incoming alerts without deploying antenna
- Improved performance - DFU, camping, call setup
- New features - Location Tracking, SOS assistance, eCompass
- New security and encryption algorithms

Key Contribution
- Contribution to define system and spec requirements
- HW and SW design, performance tuning

Value additions
- Surpassing customer expectations on battery life
- Fast recovery to coverage
- Agile methodology adapted to fulfill the changing scope/requirements without slippage in schedule or additional cost

Key Challenges
- Backward compatibility
- Change of requirements and scope during project
Enterprise Application: Control Room Monitor Applications

Customer
- Europe based product company

Problem Statement
- Enhancing the existing enterprise applications with new features.
- Designing new architecture using SOA architecture framework
- Migrating all the enterprise application on to SOA architecture

Solution
- Migration of Delphi based application to C#, .Net WPF
- Database from Microsoft access to Microsoft SQL server
- Tightly coupled architecture to module architecture movement based on SOA architecture
- Scalability from small enterprise to large enterprise networks
- Bringing Enterprise application architecture, Enterprise provisioning, Web application scope, and SOA
- Common database across multiple products
- Team City: Continuous integration
- Standardised UI testing using Selenium

Technologies
- C++, C#, .Net, WPF, SQL database, C++, Standardised automated testing of UI components (Selenium)

Value additions
- Bangalore, India and UK

Status
- Ongoing
The Sasken Advantage

**ITIL/ISO/SEI-CMM CERTIFICATIONS**
- Best Practice Framework
- Well established training programs
- ISO 20K, ISO 27K
- SEI CMM Level 3
- Qualified PMP and SCM’s

**IP and TOOLS COMPETENCY**
- Sasken’s IP 2G/3G protocol stacks or multimedia codecs are used for early development and delivery
- Under one tool all project management, Requirement management, Tracking, Reporting
- Secure development environments

**MULTI-LEVEL ENGAGEMENT**
- End-to-End Design and Development
- Enhancement, Maintenance and Sustenance
- Testing
- Professional services

**DELIvery**
- Robust Global Delivery Model
- World Class Global Delivery Team
- Supported with Fixed price, Time & Material, KPI based model, Delivery based model
Satellite Communication