

Turnkey Integrated Satellite Operations Solution for ProtoStar

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ProtoStar: new commercial satellite operator in Asia

- ◆ ProtoStar I is a Loral FS1300 satellite
 - Bought existing, built but not launched satellite, modified for ProtoStar's market
 - Short delivery schedule
 - ◆ Current launch date is May 2008
- ◆ Operations being outsourced to business partners in region
- ◆ ProtoStar responsible for provision of the entire ground system
 - 8 month delivery schedule
 - Low risk, proven solutions
 - Low operations costs
 - System needed to include:
 - ◆ Antenna/RF systems
 - ◆ Satellite command and control system
 - ◆ Communications System Monitoring (CSM) system
 - ◆ Ground equipment M&C and network management system
 - ◆ Frequency planning system

- 🖥️ **Traditionally operators procure stovepipe systems to address each area of satellite operations**
 - ◆ **Using department of energy definition of “Stovepipe system”**

“systems procured and developed to solve a specific problem, characterized by a limited focus and functionality, and containing data that cannot be easily shared with other systems.”

Department of Energy 1999

- 🖥️ **ProtoStar evaluated traditional options before selecting ISI’s turnkey, integrated ground system solution**

Stovepipe Systems

TT&C Ant./RF, with M&C

Teleports/comm. networks

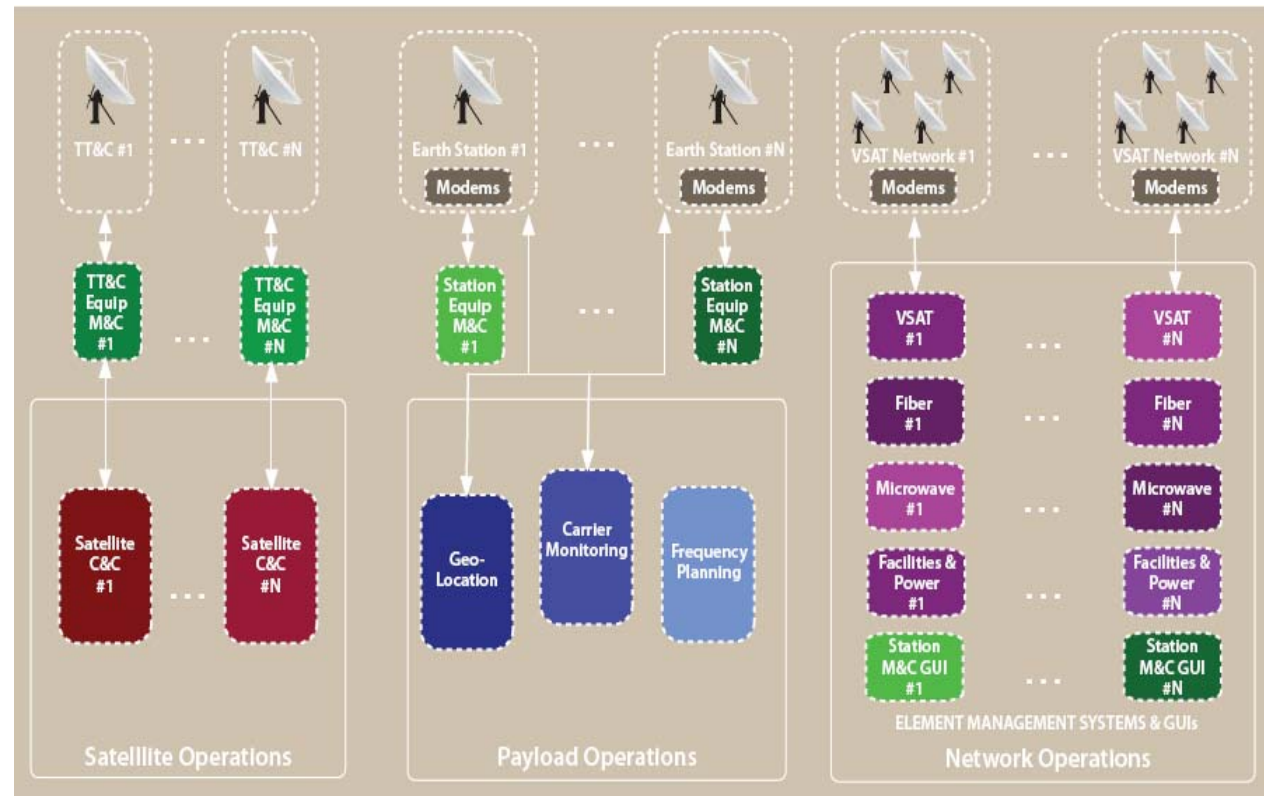
- M&C systems
- Network management

C&C system(s)

CSM system

Geolocation

Frequency planning



Numerous “stovepipe” systems to operate and maintain that cannot readily share data between systems and cannot be readily expanded to support growth of your operation

- **Business pressures are demanding efficiency improvement of operations teams**
 - ◆ **Operations teams now operating more satellites, of different types, with same or even fewer people than before**
 - Automating more routine operations and analysis functions
 - Pushing more responsibility onto satellite controller staff
 - ◆ **Procuring ground system separate from the satellite**
 - Lower price
 - Direct control over the ground system provider
 - Easier control automation requirements and implementation
 - ◆ **Operators can't keep adding standalone systems due to space, power, complexity, extra staffing - need flexibility of one system to grow with new business demands**

- **This trend is very similar to that seen by the business software industry**

- **Industry analysis has shown more and more staff time and money is being spent on diagnosing anomalies**
 - **Operators, engineers and management need quick access to a range of data from different systems**
 - ◆ **“Overall operators report that satellite operations staff spend 20-40% of their time on anomaly-related activities...”**
 - GEO Commercial Satellite Bus Operations: A Comparative Analysis, Futron Corp, Dated August 13, 2003
 - **Staff need to make quick and correct decisions, solve problems, and rapidly restore customer services**
 - ◆ **“The analysis and resolution of these (operator) errors as well as hardware anomalies drive up the staffing demands and consequently, operating costs”**
 - Satellite system Acquisition: A fresh approach to Evaluating and Purchasing a Communication Satellite System, by Harold E. McDonnell, SATMAGAZINE.COM, January 2004
- **Future efficiency gain achievable**
 - ◆ **Give operators access to MORE DATA with correlation and analysis TOOLS to provide immediate access USEFUL INFORMATION**
 - ◆ **Allow faster diagnosis and resolution of anomalies**



Business system of systems evolution

1. Custom stovepipe systems for each application
2. COTS stovepipe systems for each application
 - Automation of routine stovepipe system operations
3. Integrated COTS systems to provide full situational awareness of the business operation
4. Enterprise level systems with web enabled dashboard displays
 - Provide valuable operations and business information
 - Based on the fused data set of the integrated systems
 - Web based display system to provide wide, yet controlled access



Satellite ground systems following the same evolution



Integration of stand-alone stovepipe systems

- ◆ Real-time access to all systems data, event messages, etc.
- ◆ Every operation group has knowledge of other systems statuses
 - Problem in one system often causes symptoms in other systems
 - Integrated analysis of data from multiple systems to give full situational awareness
 - Immediate knowledge of problem source, not just the effects
- ◆ Results is full situational awareness
 - Improve efficiency
 - Reduce operations costs
 - Faster response times
 - Better quality of service
 - Better customer service

- 🖥️ **Integration of systems can provide huge dividends**
 - ◆ Not a new idea, proven to work in other industries
 - ◆ Example: business software

- 🖥️ **Many have tried to create “system of systems”**
 - ◆ **Problem: underlying stovepipe products are not designed for integration**
 - Causes integration to be difficult, expensive undertaking
 - Results often do not meet expectations
 - ◆ **Systems are very difficult to maintain**
 - Long-term support issues with obsolete software and systems
 - Significant re-integration effort with each new product release
 - Commercial operators trying to do integration internally, end up shifting staff from operations to software maintenance

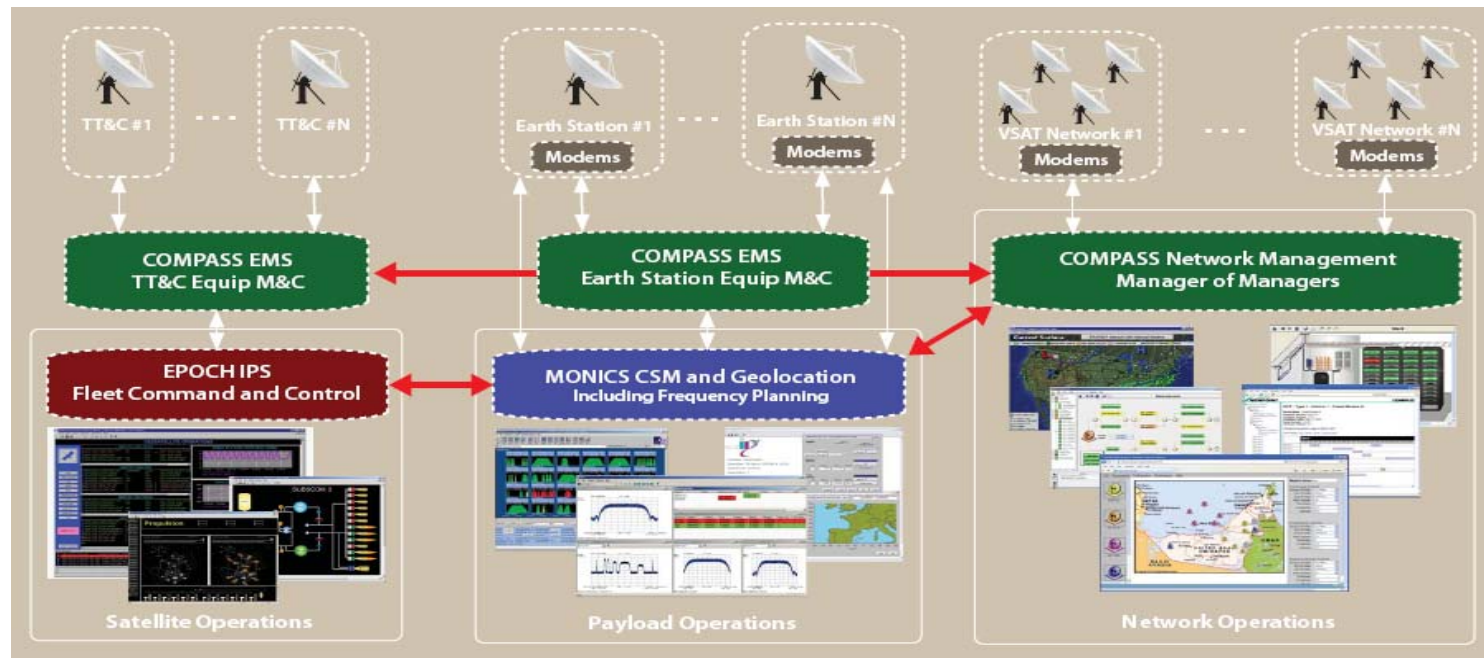
- **Already world leader in Satellite C&C systems (EPOCH IPS)**
 - ◆ Over 200 satellites supported
 - ◆ All types of mission
 - ◆ LEO/GEO/HEIO/Deep Space, Commercial/military/civil, & domestic and international
 - ◆ Over 120 GEO Comm. satellites spanning 21 satellite owners
 - ◆ 50% of commercial GEO Comm. satellites launched in '07

- **Assembled key best in breed ground system software companies**
 - ◆ **SAT Corp:**
 - Monics/SAT-DSA products
 - CSM including interference detection and characterization
 - ◆ **Newpoint Technologies:**
 - Compass & TrueNorth products
 - Equipment M&C, Network Management, Manager of Managers
 - ◆ **RT Logic**
 - Baseband to RF signal processing
 - Used in satellite test, launch vehicle telemetry, on-orbit satellite control, as well as Satellite Communications (SATCOM) and airborne communications

- **Teamed with other strategic best-in-breed product/system providers**
 - ◆ Optimal Satcom: Frequency planning
 - ◆ GSI: Antenna/RF systems
 - ◆ In-Snec: Baseband units

- 📄 **Integrate at the product level**
 - ◆ Seamless interfaces between industry leading products
 - ◆ Interfaces developed and maintained as part of the product
 - Enhanced existing open product APIs to support integration
 - Product integration guaranteed compatibility for new releases
 - Products able to support/display other systems data formats
 - ◆ Open APIs to allow integration with other 3rd party systems
 - Billing systems
 - Legacy operations systems
 - Other major systems

- 📄 **Result: an operationally responsive, low risk, proven, fully integrated, turnkey ground system, based on industry leading products**

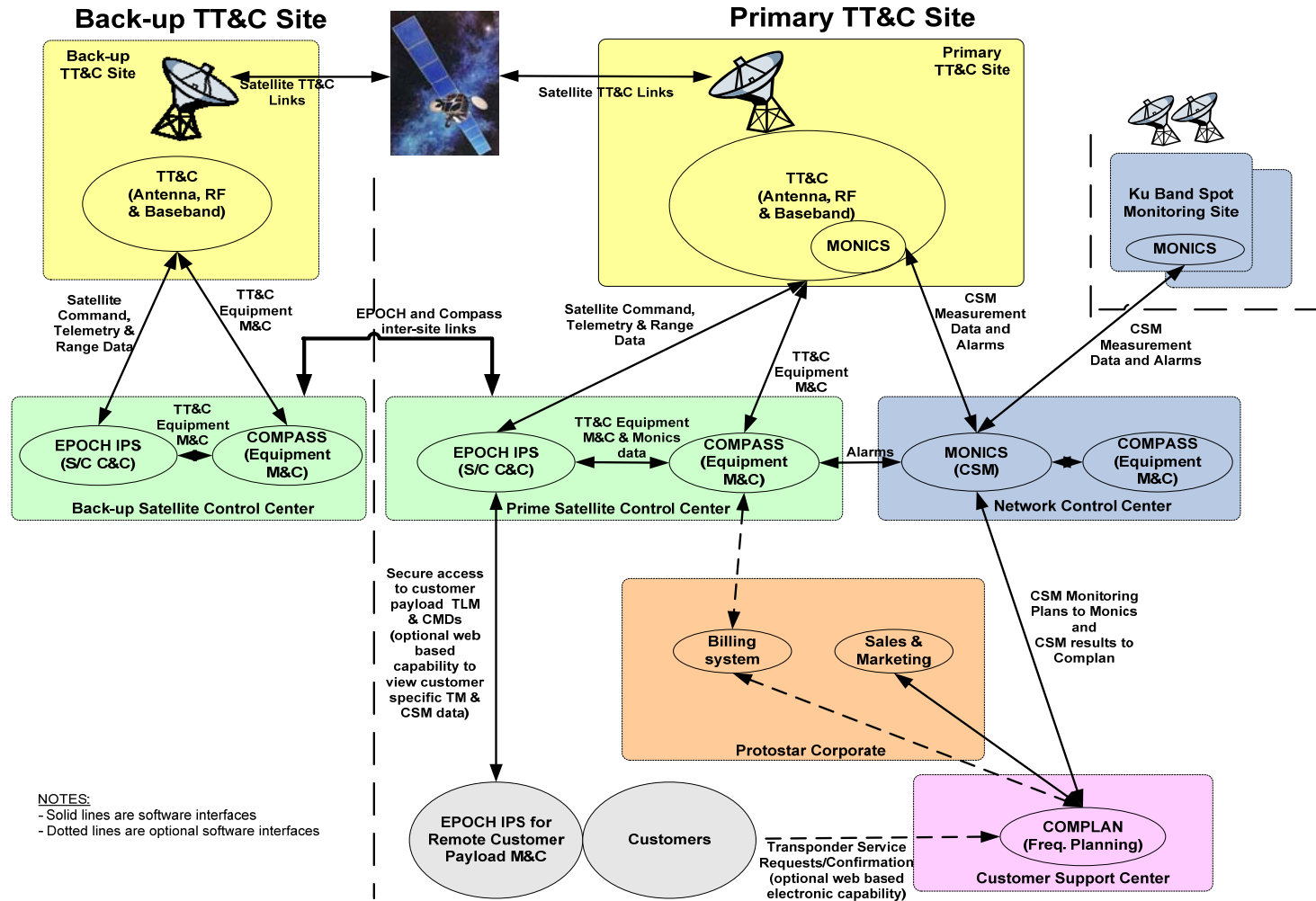


- ❑ **Common, industry leading solution for each functional aspect of the operation that is designed to scale with operator needs and minimizes operations and procurement costs**
- ❑ **Established interfaces and data/event sharing between systems for more efficient operations, enhanced situational awareness across the entire operation and improved customer support**
- ❑ **Access to Key Performance Indicators (KPIs) critical to operations and business as well as external interfaces to corporate systems (e.g. billing) with a web based dashboard system**



Advantages to ProtoStar

- ◆ Turnkey system means only one contract to manage
- ◆ Proven solution mean no risk
 - Industry leading, and proven products
 - Products already integrated
 - ◆ No risky interfaces to manage
 - ◆ No software development
- ◆ Reasonable schedule margins, even on an 8 month schedule
- ◆ Price competitive
 - Beat traditionally designed systems in competitive bid
 - Fully expect benefits of safer and improved operations with lower recurring operations costs compared to stovepipe solution
- ◆ Support system of systems that can be maintained over life
 - Software maintenance available over entire life of the satellite/system
 - Includes regular technology refresh of each product line
- ◆ Scalable to support additional satellites and ground sites





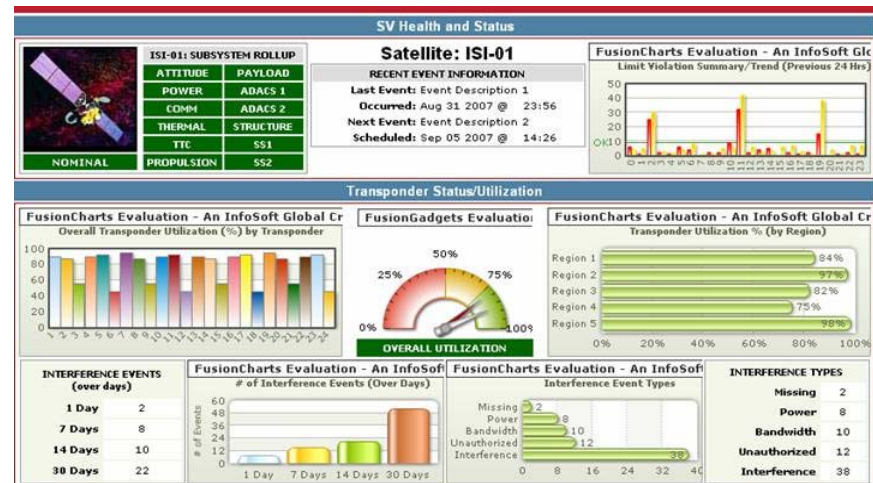
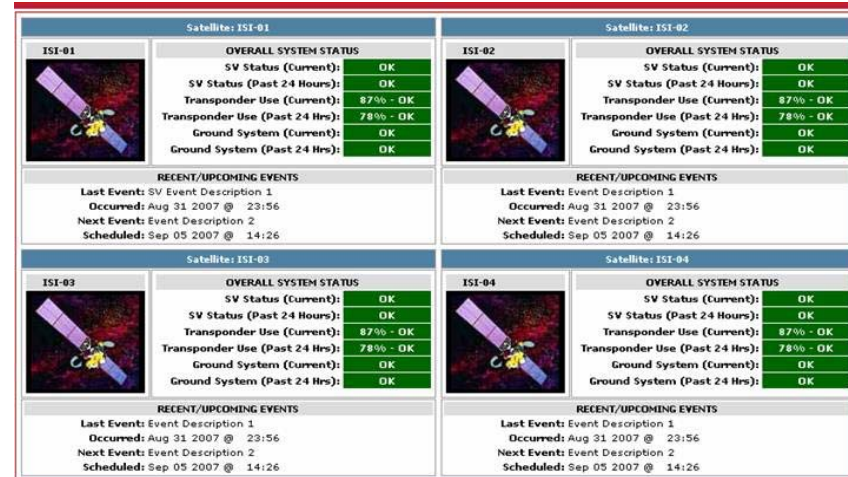
Business software evolution shows enterprise level dashboard is next

- ◆ Fusion/mining of integrated data set
- ◆ Derive key performance indicators for more efficient operation



First release of ISI's Enterprise level dashboard solution to ProtoStar in early 2008

- ◆ Dashboard offers critical information to operations, sales and executive management in near real time
- ◆ Eliminates, manpower intensive and error prone data collection process
- ◆ Also allows for remote high level monitoring of operation (valuable in 3rd party operations scenarios like ProtoStar)



- **Satellite operations business is maturing**
 - ◆ Companies must continue to reduce costs while improving service
 - ◆ Using proven methods employed by other industries is smart business

- **Integrated solutions are “next step” in operationally responsive satellite ground systems**
 - ◆ Follow proven model of business software industry
 - ◆ Integration done at product level to achieve maximum benefits
 - ◆ Allowed successful 8 month delivery of turnkey ground system
 - ◆ Enterprise dashboard maximizes value of integrated data set for both operations and for all other stakeholders
 - Provides timely access to data reflecting the performance of one’s business and operations
 - Supports remote high level monitoring of operation

- **ISI continues to be technology and innovation leader**

- **ProtoStar I system is first of the next generation of satellite ground systems**