# The Communication Systems Integrator Provides Solutions for Tactical Shipboard Communications

*Tactical platform communications system integration is a specialized, multidisciplinary skill found in neither a general systems integration house or a small support contractor. L-3 is the world’s leading shipboard communications system integrator.*

## Roles of the tactical communication system integrator

Acquisition of a tactical communication system for a platform such as a military ship may be the responsibility of a government, a shipbuilder, or a ship systems integrator. In any of these cases it is prudent to procure the system from a company that specializes in the integration of communications systems for maritime environments and tactical organizations.

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<thead>
<tr>
<th>Role</th>
<th>Description</th>
<th>Value Added</th>
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<tbody>
<tr>
<td>Requirements Analysis &amp; Allocation</td>
<td>Interpret customer needs &amp; specifications</td>
<td>Advise customers on impact &amp; interaction of requirements</td>
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<tr>
<td>Systems &amp; Detailed Design</td>
<td>Architecture, design, equipment selection, environmental, security, cable plant</td>
<td>Reduce manpower, optimize mission performance, ensure long-term system viability, meet both requirements &amp; needs</td>
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<tr>
<td>Integration Engineering</td>
<td>Compatibility analysis &amp; lab testing, software driver design, &amp; Information Assurance/Interoperability certification</td>
<td>Avoid risky reliance on vendor documentation. Assure interoperability, ease of use, &amp; consistency of HMI</td>
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<tr>
<td>Performance &amp; Environmental Verification</td>
<td>Analysis; environmental, functional performance, &amp; stress testing</td>
<td>Reliable, available system that users inherently trust &amp; use to perform their mission duties intuitively</td>
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<tr>
<td>Installation Planning/Installation &amp; Checkout</td>
<td>Staging, sequencing, light off, &amp; incremental testing all within a construction zone</td>
<td>Catch issues early, ensure system works upon installation, protect shipyard schedules, allows comm system to support remainder of ship construction</td>
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<tr>
<td>Life Cycle Support</td>
<td>Whole range of logistics, training, documentation, &amp; obsolescence management</td>
<td>Minimum manpower to administer, maintain, &amp; update; ensure system remains operational</td>
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<tr>
<td>Overall</td>
<td>Long-term commitment, attitude, approach, &amp; investment</td>
<td>“Future-proofing” of the customers purchase of a tactical communication system</td>
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All the roles identified above exist for generic systems integration but the details of execution are peculiar to tactical communications in a maritime environment.
Many organizations claim to do communication systems integration

The scope of work performed by a good communications system integrator is frequently coveted from both above and below along the acquisition food chain. Ship System Integrators or even shipbuilders decide they can just buy the communications equipment directly and do the integration work themselves. Support contractors think they can expand from providing installation labor to taking on the integration role. None of these groups have a successful record in the role of communications integration.

Problems of a ships systems integrator in the communications role

It is now common in military ship construction for a large defense contractor to be given the role of Ship Systems Integrator (SSI). The split of responsibilities between the shipbuilder and the SSI varies, but the SSI is responsible for the majority of mission electronics across the platform. This is a major and complex responsibility. It requires a large organization with management skills, staff, and tools able to cope with the immense amount of data involved. The SSI performs a significant amount of the work in-house, but also manages a large number of subcontractors. There is always a natural tension between the desire of the SSI’s management to maximize its own scope and the need to give scope to team members in order to maximize the probability of winning the program in the first place. Ideally, the allocation of scope in-house and to subcontractors results in the most competent organization being assigned each work package. This does not always occur.

There is a tendency for SSIs to view communications as an area into which they can easily expand to increase their scope and reduce costs. They usually have an overly simplistic understanding of communications and lack the real-world experience needed to assure success. A common occurrence is for the SSI to address tactical communications using COTS technology without an appreciation for the differences between business communications and tactical communications, or for the multitude of interacting requirements that allow tactical personnel to trust their communication system to serve them during all conditions including casualties, heavy seas, and battle damage. They often assign bright, young, tech-savvy engineers to their new communications group but no one in the group brings operational or prior program experience to the project.

Problems of a support contractor in the communications role

While SSIs attempt to work themselves down the food chain, contractors experienced in the installation or maintenance of communications equipment sometimes try to climb up the food chain and go after communications integration programs. Generally, they have relatively low overheads so they are attractive to a shipbuilder or SSI from a rate standpoint. However, like the SSI, these installation support contractors are not equipped for the role of communications integration. They do not have the breadth of design skills, experience, and tools required. They rarely have the financial strength or engineering depth necessary to successfully work through the challenges facing the integrator on a major program.

Communications system integration is indeed a specialized field

This series of solution briefs explores the many ways in which tactical communications requires architectures and equipment purpose-built for tactical organizations. Anyone purchasing a tactical communication system should investigate bidders very carefully to see that the bidder has the requisite skills and proven experience across many customers, many platforms, and enough years to unmask latent problems.
The Ideal Tactical Communication Systems Integrator

Success as a tactical communication system integrator requires critical mass to be built up over many years of experience. Re-use is critical. Rare are the programs that can afford to pay for a custom communication system created from the ground up. A good communications integrator builds up a set of integration tools, a library of designs, and a talented knowledgeable staff of engineers and program managers who make a career of communications integration. Each year a combination of investment and integration contracts adds to the skill set, available tools, designs for reuse, and lessons learned. Each program served by this integrator gets a far better system than could be afforded by anyone starting from scratch.

Skills
An organization that specializes in tactical communications integration requires a core set of engineers who work tactical platform programs year after year. The organization needs to build up a culture in which the nuances of tactical organizations, communications, platform characteristics, environment, security, and a myriad of other considerations are passed on from generation to generation. Critical mass is important in order to have in-house expertise across a broad spectrum including hardware and software design, RF analysis and design, environmental mitigation and testing, communications architecture, mechanical packaging, and power systems.

Tools
The bulk of any tactical communication system will consist of off-the-shelf equipment purchased by the integrator from worldwide suppliers. However, the integrator must provide a communications architecture, switching services, call management, conferencing, intercom services, specialized voice terminals, and a powerful communications manager. These are the tools of the integrator that must be applied across programs and be in a constant state of upgrade and evolution to keep up with technology and the marketplace of communication equipment.

Investment and commitment
Success requires a long-term corporate commitment to invest in tool development, human resources, and support of delivered systems within the niche market of tactical communications. Commensurate with the service life of the platforms being served, the corporate commitment needs to span decades.

Proven experience
Communications integration skill comes from years of experience across many platforms and many lessons learned. The experience of an ideal communications integrator includes:

- A large number of programs with deployed systems operating successfully
- A range of platform sizes and missions including both surface/subsurface and land-based sites
- A range of customers and geographic regions served
- Broad scope that includes internal and external integrated networks and communications, communications management, and extensive interoperability with other ship systems
- Contracts with tasks ranging from studies and architecture through production and test to installation and checkout, logistics, and life-cycle support.

Facilities
Look for extensive lab and system test facilities. Labs are needed for interoperability investigation, environmental and EMI/EMC testing, and software driver development on an individual equipment or equipment string level. Larger facilities are needed to house permanently a system representing a superset of representative communication equipment for continual enhancement of the firm’s integration tools, both hardware and software. Finally, large facilities are needed for final assembly and test of complete systems prior to delivery.
A communication system integrator can “future proof” a system

Alignment of long term goals of the tactical organization and the communication system integrator minimizes the impact of technical obsolescence and supports the low risk introduction of technology updates into the communications system throughout the life of the platform. There are many ways in which the integrator can do this.

**Architecture** — Some platforms contain a hodgepodge of stand-alone communication systems with no coherent architecture. The individual systems obsolesce at different rates. They have independent support systems if they are able to be maintained at all. No training or maintenance documentation exists across the system boundaries. There may be some interfaces between systems but no planned interoperability.

A good communications integrator will start with an architecture that looks at all the communications needs across the platform and addresses how to bring communication services to each user in a coherent fashion. This is not only good for the user of the services, but it also saves money throughout the life cycle of the platform. Cable plant complexity is reduced. The quantity of equipment is reduced. Maintenance is reduced and able to be coordinated as a total system. No longer do parts of the system (such as separate intercom systems) fall into disrepair and become untrustworthy and therefore unused.

**Evolutionary integration tools** — Systems such as commercial PBXs are characterized by a rather short period of production before they are superseded by a newer model or series. This period is much shorter than the life of a tactical platform on which they may be used. For a while, new models within the same series may be compatible with older models. However, after several more years, the original series will no longer be maintained by the manufacturer. Customers will be expected to upgrade to the latest series. In this case, upgrade means replacing the fielded system with a new one.

In contrast, a good communications system integrator will treat backward compatibility and interoperability as requirements for the voice and data switching, conferencing, and communications management integration tools used in its systems. The integrator works on a timescale that parallels the platforms he services. A customer who installs an ISDN-based system today should not have to replace that system in five years if he decides to incorporate VoIP technology into the system. A good integrator would allow newer IP-based equipment to transparently interoperate with fielded equipment that happens to use different interface technology.

**Sustainability** — The integration tools, like everything else today, is built with COTS components subject to rapid replacement in the marketplace. A good integrator must incorporate sustainability into his organization, investment plans, and architecture. Use of COTS assemblies (such as single-board computers, voice recorders, laptops, etc.) should recognize that the specific model of assembly will very likely change from year to year and thus be different from one delivery to the next. Functionality should not change and interfaces should be designed such that any differences from one model to the next are transparent to the software and hardware. For assemblies manufactured from COTS components by the integrator, a proactive sustainability program is required to assure that the assembly can continue to be manufactured and supported for a period of years far exceeding the market availability of specific piece parts.

**Tech Refresh** — A good communications integrator can be counted on to still be around and actively growing his toolkit of products, services, skills, and knowledge dedicated to tactical communication integration when the customer is ready to add new capabilities to a deployed platform. The long-term track record of the integrator is so important. Software upgrades should be available to incorporate whenever the customer decides it is time. New terminals and other hardware should be able to be added to existing systems with assured interoperability.
L-3 Communication Systems East is the world’s leading Communications System Integrator

Our commitment to tactical shipboard communications integration and management never flags, decade after decade. Embracing new technology and developing new generations of knowledgeable staff, L-3 offers competitive solutions addressing the operational mission and procurement needs of the worldwide tactical maritime market. Understanding the operational environment and having a deep experience base leads to integrated solutions that enable the tactical organizations to perform their missions more effectively, more responsively, and with fewer personnel. Our solutions are characterized by:

- Intuitive, easy-to-operate user and administrative terminals
- Enhanced situational awareness by providing each user with all the information needed
- A core suite of L-3 integration products enabling the use of communications equipment from any vendor desired by the customer (“radio agnostic”)
- Interface to external systems in a manner that makes all services, features, and interfaces available to all authorized user terminals
- A resource manager, Symphony™, enabling a reduced ship’s force to manage communications, networks, and other ship systems without requiring years of experience
- A “future-proofed” architecture that is sustainable, supportable, and conducive to technology insertion at periodic intervals rather than replacement over its lifetime.

Our systems include submarine and surface platforms, ship and shore installations, US Navy and Coast Guard, and both domestic and international customers. We have a consistent philosophy of building a single product baseline; every new installation benefits from all the capabilities generated and the experience gained from previous missions. Ongoing investment and sustainment programs constantly expand our product capabilities while keeping them technically refreshed and producible.

**Affordable Communications for Network Centric Warfare**

### Interior Communications
- Aegis MarCom®
- Virginia Class

### Exterior Communications
- LPD-17
- Los Angeles Class

### Integrated Communications
- RNZN ANZAC
- LCS-2
- Ohio Class
- Egypt Fast Missile Craft
- Australia HMAS Sirius
- Australian Navy LHD
- National Security Cutter
- USS Lincoln CVN 72
- USCG Sentinel

**Interior, Exterior, Both - We Do It All!**
Our understanding of tactical communications and tactical missions drives the design of our integration tools: MarCom IVCS, MarCom BBS, IP adapters, voice terminals, and Symphony Communications Manager.

### L-3’s Flexible Architecture Model Ensures Best Value Solution for the Customer

**Symphony Communications Manager**
- Automated remote control of shipboard communications and networks
- Monitoring of communications and other ship systems at a common location
- Mission-oriented communication plans.

**MarCom® Integrated Voice Communication System**
- Tactical and administrative voice communications in one system
- Complete set of tactical features: net operations, conferencing, intercom, and radio circuits
- Red and Black audio in one tactical switch
- Unlimited multi-channel monitoring for situational awareness
- Interoperable with all voice systems
- ISDN, VoIP, Analog—Your choice!

**Symphony Communications Manager**
- Enables automation of radio rooms until legacy circuits go away
- Interoperable with emerging IP conversion products for an evolutionary transition
Representative Supplied and Supported Systems

- US Navy’s Los Angeles Class Submarines
- US Navy’s Aegis DDGs and CGs
- US Navy’s LPD 17 Class LPDs
- US Navy’s Littoral Combat Ship #2 and #4
- US Navy’s Virginia Class Submarines
- US Coast Guard’s Legend Class National Security Cutters
- US Coast Guard’s Sentinel Class Fast Response Cutters
- Royal Australian Navy’s Canberra Class LHDs
- Royal Australian Navy’s Fleet Tanker
- Egypt’s Fast Missile Craft
- Royal New Zealand Navy’s ANZAC Class Frigates

Worldwide Installations of MarCom Systems

Proven installed base of operational systems lowers risk and ensures long-term supportability.
Why L-3 CS-E Camden

- Pioneer proponent of communications system integration throughout a platform, crossing organizational boundaries – Focus on the user!
- Proven supplier of integrated communications on over 200 platforms for over 30 years
- MarCom and Symphony product suites provide core elements for full communications integration
- Platform agnostic, affordable solutions to meet customized requirements
- Over 100 engineers dedicated to supporting shipboard communications programs
- CMMI Level 3 Certified Processes
- JTIC certified for Information Assurance and Interoperability
- Secure communications and Information Assurance experience; leading supplier of cryptographic equipment
- Providing logistics support and spares for over 50 years
- Local L-3 support.