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Open Systems Architecture License Rights: A New Era
for the Public-Private Market-Place

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Panel 6. The Role of Competition in Contracting

| Wednesday, May 14, 2014 | |
|--------------------------|--|
| 1:45 p.m. – 3:15 p.m. | <p>Chair: Elliott Branch, Deputy Assistant Secretary of the Navy (Acquisition and Procurement)</p> <p><i>Gaining Leverage Over Vendor Lock to Improve Acquisition Performance and Cost Efficiencies</i> Virginia Wydler, MITRE Corporation</p> <p><i>Open Systems Architecture License Rights: A New Era for the Public–Private Market-Place</i> Nickolas Guertin, DASN RDT&E Howard Reichel, In-Depth Engineering Corporation</p> <p><i>Strategies for Competition Beyond Open Architecture (OA): Acquisition at the Edge of Chaos</i> Niraj Srivastava, Raytheon Michael Rice, R2E, Inc.</p> |



Open Systems Architecture License Rights: A New Era for the Public-Private Market-Place

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Abstract

The prosperity of our nation is driven by brilliant and hardworking entrepreneurs who convert their intellectual property into revenue in our free market economy. Abraham Lincoln, in his creation of the Patent Office, understood that guaranteeing an entrepreneur's ownership of his or her own intellectual property is the only thing that could add the "fuel of interest to the fire of genius"¹ necessary to incentivize entrepreneurs to take the risks and provide the sweat equity necessary to make our nation truly prosper. The resulting commercial business cycle, that interposes the entrepreneur, intellectual property rights, venture capital, and a vast and complex commercial market, has produced the world's most innovative and extensive market place. The efforts of these entrepreneurs, when harnessed by the Department of Defense, built the world's most advanced military. The extent to which an entrepreneur is able to control the use of his or her intellectual property in this business partnership is a continuing source of struggle. It pits a Federal Government that needs to minimize cost using the mechanism of competition against an entrepreneur who seeks to protect his or her intellectual property to stay in business.

This paper, using the metaphor of the "Shark Tank®" (a television show aired on the American Broadcasting Company (ABC®) examines this relationship—and argues that the Federal Government should extend the IP protections currently afforded to the entrepreneur in the DFARS 252.227 to include what we term "Open Systems Architecture License Rights."

Introduction

At the core of our free market economy is the premise that we need to incentivize hard working entrepreneurs to build magnificent products that form the foundation of prosperity in our Country. Abraham Lincoln understood that giving an entrepreneur ownership of his intellectual property (IP) adds the "fuel of interest to the fire of genius"² needed to achieve this prosperity. With IP ownership, an entrepreneur earns money to build

¹ "Second Lecture on Discoveries and Inventions," Collected Works of Abraham Lincoln, Vol. III, 1865.

² Ibid.



a business that employs many, and also sustains a standard of living for himself and his family. Our strong confidence in American entrepreneurship drives our national policy that requires our Federal agencies to purchase needed products and services from commercial sources.³ As the monopsonistic (single buyer) purchaser of billions of dollars of unique products each year, our Defense Department strives to utilize acquisition approaches that balance the need to permit entrepreneurs to own and control their IP with the need to provide affordable warfighting equipment. A steady evolution of acquisition theories and contracting approaches have been developed and refined over the decades to address the complex issue of IP ownership and license rights within the Department of Defense. This paper uses six illustrative examples to explore the relationship between intellectual property rights, customer requirements, and venture capital in the commercial, Federal, and Defense markets. The paper points out notable benefits and issues with different arrangements—and supports a new type of license arrangement termed *Open Systems Architecture License Rights*—appropriate for acquisition programs that have embraced the Open Systems Architecture Business Model.

In his March 11, 2010, remarks at the Export-Import Bank's Annual Conference, President Barack Obama railed against international IP theft when he stated,

Our single greatest asset is the innovation and the ingenuity and creativity of the American people. It is essential to our prosperity and it will only become more so in this century. But it's only a competitive advantage if our companies know that someone else can't ***just steal that idea and duplicate it with cheaper inputs and labor***. There's nothing wrong with other people using our technologies, we welcome it—we just want to make sure that it's licensed, and that American businesses are getting paid appropriately.⁴
[emphasis added]

While his remarks were offered in response to unrelenting international theft of American IP, his words notably reiterate the precept that ownership, protection, and subsequent licensing of IP is the source of great prosperity in our country. It is the conversion of IP to earnings that makes or breaks any entrepreneur. Every entrepreneur must jealously guard his or her IP, lest the fire of genius not yield the earnings required for survival.

One entanglement faced by all inventors and entrepreneurs is the need to seek venture capital necessary to fully develop and bring their IP-based product to market. The introduction of a third party—namely the venture capitalist—introduces the possibility that an entrepreneur's ownership or control of his or her IP will be diluted or lost. Venture capital (VC) is typically acquired through (1) the sale of equity in the entrepreneur's company (e.g., an investor as a minority business partner), or (2) the sale of a license associated with the IP (e.g., a licensed reseller who seeks a royalty). In a wide variety of legal frameworks, licenses typically provide for use, modification, or resale of the intellectual property.

The relationship of an entrepreneur, intellectual property rights, and venture *capital in the commercial market*—along with equity sale and license arrangements—adheres crisply to the thoughts of Presidents Lincoln and Obama. However, the relationship between an

³ Executive Office of The President, Office of Management and Budget; August 4, 1983 (Revised 1999).

⁴ Remarks President Barack Obama at the Export-Import Bank's Annual Conference, March 11, 2010.



entrepreneur and the Federal Government is notably different in the marketplace that exists to provide the array of products and services required for the defense and security of our nation.

Shark Tank, a television show aired on the ABC® network, provides an interesting metaphor in which we can examine the relationship of entrepreneurs, IP, and VC in six different models of business transactions:

1. Standard Commercial
2. Commercial Variant for Federal Customer
3. Legacy DoD
4. Awkward Transition
5. Small Business Innovative Research (SBIR)
6. Open Systems Architecture Business Model



Figure 1. The Shark Tank Television Show

Shark Tank centers around five powerful self-made millionaires and billionaires, referred to as the SHARKS, who make or break the dreams of hopeful entrepreneurs (Figure 1). The Sharks invest their own money in a small set of startup businesses, giving them the capital they need to build their businesses. The SHARKS are billionaire Mark Cuban, owner & chairman of AXS TV and owner of the Dallas Mavericks; real estate mogul Barbara Corcoran; Queen of QVC Lori Greiner; technology innovator Robert Herjavec; fashion and branding expert Daymond John; and venture capitalist Kevin O'Leary. Some of our transactions will require interaction with other Sharks.

Shark Tank Round 1: Standard Commercial Transaction

We begin with a standard commercial transaction. Figure 2 provides a hypothetical software application call the “Algebra Solver,” built to assist high school students in their efforts to solve algebra equations. The application is hosted on any smart phone or portable computing device that has an integral camera. The application provides that once a user takes a picture of an equation, the application solves it automatically, displaying the result for the student. Simple.

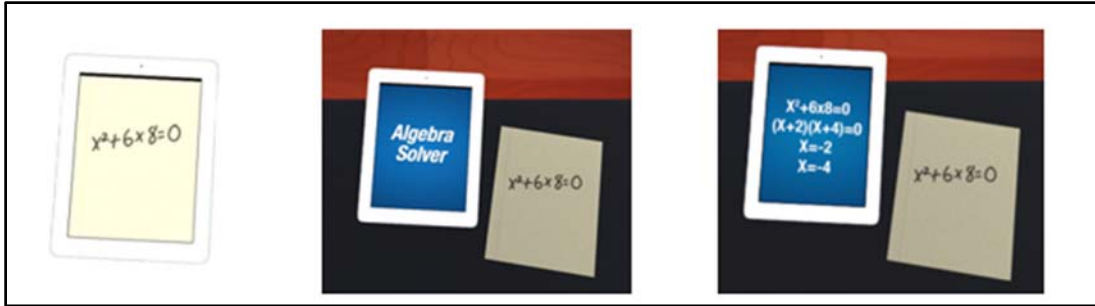


Figure 2. Standard Commercial Transaction

In this example, an entrepreneur has invested his own time and funds to derive and instantiate the algebra solver, has filed for and received a utility patent, and expects to build a set of derivative products (e.g., Geometry Solver, Trigonometry Solver and Calculus Solver), but lacks sufficient capital to fully commercialize the product and bring it to market. Thus he arrives in the Shark Tank.

The basic script of the Shark Tank script (for those who have not seen it) is somewhat predictable:

- Entrepreneur: “I’m looking for an investment today of \$200K for a 25% equity stake in my company”
- Shark: “Do you have a patent?”
- Entrepreneur: “Yes – a utility patent.”
- Shark: “Good – because that makes it worthy of investment – as I feel comfortable that no one can quickly build a knock-off and squeeze us out of the market.”
- Shark: “What were your sales, margins, and profits?”
- Entrepreneur: My earnings last quarter were \$100K.
- Shark: “Why do you value your company at 8 multiple of earnings?”
- Entrepreneur: 8 times earnings seems fair – considering the massive market for the “Algebra Solver” – and a large derivative market.
- Shark: “Ok – I’m interested!”

The entrepreneur might get two offers from the Sharks. The first might come from Mark Cuban, who offers an equity deal. He offers to provide the \$200,000 of VC. His capital investment is notably much larger than the entrepreneur’s, but he’s willing to be a minority partner in this business because the entrepreneur has control of the IP. His ownership of shares in the Algebra Solver Company means that he owns a piece of the IP, but has no independent right to use, modify, or resell it. VC recovery and any additional profit are provided to Cuban from dividends on his shares of stock and/or the sale of the company in the future.

The entrepreneur also gets an offer from Kevin O’Leary, who offers a “license play” for the Algebra Solver only. He offers to provide the \$200,000 in VC, offering to serve as a licensed reseller seeking a royalty. O’Leary states that he has a friend who is well positioned at a major textbook publisher. He envisions a single seat license of the app being included with the sale of traditional textbooks. He would be a reseller, making the deal with the publisher. In exchange, he wants to receive a royalty on a per-book-sold basis. In this

second case the Shark makes no ownership claim at all to the IP. Table 1 provides a summary of a standard commercial transaction.

Table 1. Commercial Business Model

| | |
|-----------------------|--|
| Requirement/Need | High School Kids with Algebra Homework |
| The Idea/Approach | The Entrepreneur |
| The Market | Large—Kids Across the Planet |
| Initial Investment | The Entrepreneur |
| Intellectual Property | Utility Patent (Software Is a Collection of Processes) |
| The Venture Capital | Seeking Venture Capital from the Sharks |
| Proposition | Seat-License of App, SW Upgrades, Derivative Products |
| Shark Goal | Minimize Investment, Maximize Profit |
| Entrepreneur's Goal | Build Stable Business, Maximize Profit |
| Customer's Goal | Solve Math Problems |

While the details of this commercial transaction are of little consequence to a reader focused on the Federal market space, the example introduces the fundamental structures of any transaction: an idea, an early product, the need for venture capital, a commercialized product, volume sales of the product, capital recovery, and profit. Importantly, the reader should note that in the standard commercial transaction, the entrepreneur always retains ownership and control of the IP, and that the entrepreneur, venture capitalist, and customer are separate entities. The following five rounds of Shark Tank explore hypothetical transactions between the entrepreneur and the Federal Government—in which these assumptions are contorted—and examine the associated pros and cons.

Shark Tank Round 2: The Commercial Variant for Federal Customer



Figure 3. The Commercial Variant or Federal Gov.

Entrepreneur: “I offer to the sharks this afternoon the “Automated Gun Detection System” – targeted for introduction into a Department of Homeland Security (DHS) X-ray machine (Figure 3). I’m the owner of a large radiography manufacturing company and I sell devices all over the world. Our X-ray line of products is built upon IP described in 17 different patents that we own. Funds required for initial development have been repaid long ago. As you may know, most radiography systems require a very skilled operator to find contraband and items of interest in the image. The software/hardware augmentation to this system that I offer to you this morning will automatically detect and localize guns. Our proprietary patented algorithm works in over



95% of TSA described test cases. I seek \$750K of investment in exchange for a licensing agreement in which I'll offer 10% of the net profit from the first 1000 units, which I estimate to be \$1.25M in the next 2 years."

Shark: "I'm impressed. Why do you need us? Why isn't this funded by DHS?"

Entrepreneur: "The IP associated with this product forms the entire basis of my company. If I accept VC from the government, they will require that I give them a Government Purpose Rights License to the portion of the product built with their funds. This license arrangement provides that the IP involved in the resulting product, including the base radiography device, might ultimately be shared with my competitors. I need to retain ownership of this product, and any derivative products, to ensure survival of my company. I therefore choose to seek independent venture capital."

Shark: "So how many units have they ordered?"

Entrepreneur: "Well – the units aren't built or ordered – but I have a standard issued by the National Institute of Standards and Technology (NIST) indicating that they want a machine of this type – and an RFI from DHS seeking vendors with this capability. The RFI describes a long range plan to buy 5000 units."

This round of Shark Tank poses the case in which the Federal Government wants to procure a product that is largely a commercial product—with a small yet critical enhancement. Like the simple commercial transaction in Shark Tank Round 1, the commercial variant is based upon the IP held by the entrepreneur. The base product's commercial market (radiography products with 17 patents) dwarfs the Federal market such that the entrepreneur is unwilling to yield control or co-mingle IP in any way. The entrepreneur seeks commercial funding to avoid IP entanglement with DHS. DHS appreciates this approach, as they frequently lack the resources to manage and oversee a development program of this magnitude and often prefer to purchase completed units.

Securing VC from the sharks in this case is a challenge for the entrepreneur as the market need is not assured. The entrepreneur must work with the Government customer to find a way to provide evidence of procurement intent such that the VC feels confident that there is a market for the product when completed. This chicken and egg situation, in the opinion of these authors, is a notable weakness of this model. Also troubling in this model is the Government's lack of detailed control of product design, performance, and development schedule.

Like the standard commercial model, the Commercial Variant provides that the entrepreneur retains control of the intellectual property, and maintains the clean separation of the entrepreneur, the venture capitalist, and the customer. Table 2 summarizes the commercial variant transaction common at DHS.



Table 2. Commercial Variant

| | |
|-----------------------|---|
| Requirement/Need | Gov't Need to Find Guns and Contraband |
| The Idea/Approach | The Entrepreneur |
| The Market | Small Compared to State, Local, International, and Other Commercial. Potential Derivative Product Sales |
| Initial Investment | The Entrepreneur |
| Intellectual Property | Patented X-Ray Machine, Patented Detection Algorithm |
| The Venture Capital | Seeking Venture Capital from The Sharks |
| Proposition | Revenue Earned in Volume Sales, VC Repaid via Royalty |
| Shark Goal | Minimize Investment, Maximize Royalty |
| Entrepreneur's Goal | Maximize Profit, Derivative Sales |
| Customer's Goal | Enhance Security |

Shark Tank Round 3: Legacy DoD

This round permits us to consider the relationship between an entrepreneur and the DoD in the legacy acquisition environment circa 1985 (Figure 4). Let us transport ourselves in time for a moment to the Legacy World, in which the DoD was the predominant buyer of software intensive systems. The business model and electronics market of that era required large investments in monolithic systems that had very specific use.⁵ Though some of the research that led to the creation of building blocks required for these systems had wide utility, the acquired systems were tightly integrated, customized, and monolithic, diminishing the potential for reuse across the defense market space or in the commercial marketplace. The authors of this paper, each of whom led the development of submarine and surface ship combat systems, know from personal experience that the monolithic acquisition approaches of that era encouraged parallel development of nearly identical systems by multiple entrepreneurs (companies) with no reuse. Demand signals for new DoD capabilities were driven by an assessment of our adversary's capabilities—with a five- to 10-year time horizon. The pace of change in available technology was less of a factor in the planning and budgeting of defense systems.

Because of the military uniqueness of the products and the extremely large size of the required VC, an Acquisition Program Manager (APM) within the Navy assumed the role of Venture Capitalist, funding and overseeing the development. The word customer in this context signifies the entity using the product (the fleet). The APM acts as a proxy for the customer in setting detailed requirements for the system, executing contracting functions, overseeing development, test, production and deployment. In their oversight function, and with the assistance of other support organizations, the APM and the customer contributed to and modified the IP during the development process. The APM provided the majority of the VC investment (well in excess of 90%). There were no other products available that could be procured to meet the customer's requirements.

⁵ Guertin, Miller, "A-RCI—The Right Way to Submarine Superiority" American Society of Naval Engineers Journal, May 1998.





Figure 4. Monolithic System Acquisition

In this market, there were very few entrepreneurs capable of building such a monolithic design. It was in the customer's interest that the systems come to fruition, even in the face of cost or schedule overruns because there was not an alternative product and the demand for the capability was inelastic. The projects were simply too big to fail. As such, the venture capitalists would add VC to the project as needed and were forced to sustain a long-term commitment to a single entrepreneur.

In an attempt to oversee the investment, the customer required delivery of knowledge products that defined the hardware and software configuration items of the design. The customer also demanded from the entrepreneur a very broad license to share the IP with other entrepreneurs, to enable competition for subsequent upgrade and support. With this very broad licensing arrangement (defined in DFARS 252.227) the APM, also acting as a VC, using competitive pressures attempted to drive down the amount of VC required for future efforts. This arrangement notably diminished the entrepreneur's control of his or her IP that is so critical to survival.

With this license arrangement in place, the APM/VC was also empowered to take over product support from the entrepreneur, using information delivered during development. Performing maintenance of a product at a different organization decoupled the intellectual capacity of the individuals associated with initial development from that necessary for maintenance. Duplicating intellectual capacity created a near-term increase in programmatic risk, as duplicative work and effort to rediscover, and at times recreate, knowledge within the sustainment organization was required.⁶ The business decision to transpose the sustainment organization from the entrepreneur to another party (funded separately by the APM/VC) was seldom exercised because of the associated high technical and cost risk.

The Legacy World in which the DoD invested massive VC into monolithic development, with all its complexity and IP nuances, yielded magnificent warfighting capability. The strategies of that era, tuned to the technical and business environment of that era, are less applicable in the modern era in which our systems are hosted on entirely

⁶ Stafford, et al. "Software Maintenance as Part of the Software Life Cycle" Tufts University, 1999.

commercial electronics, and the DoD is no longer the dominant force in software development.

Table 3 provides a summary of the legacy DoD transaction business model.

Table 3. Legacy DoD Acquisition

| | |
|-----------------------|---|
| Requirement/Need | Provide Next-Generation Capability (AN/Monolith (V)) |
| The Idea/Approach | The Entrepreneur—Many Ideas Comingled |
| The Market | Surface Ship Only—No Risk |
| Initial Investment | VC Is the Customer |
| Intellectual Property | License as per DFARS 252.227 |
| The Venture Capital | DoD Very Big Dollars |
| Proposition | Revenue Earned as Percent of VC, Profit on Production Units, Support ,and Upgrade |
| Shark (APM) Goal | Minimize Investment, Minimize Production and Support Costs |
| Entrepreneur’s Goal | Maximize Profit as Percent of VC, Production, and Support. |
| Customer’s Goal | Provide Warfighting Capability |

Let’s see how this plays out in the Shark Tank:

The Sharks as we know them are now replaced by the APM. The Sharks run a competition, and one of the entrepreneurs enters the tank:

Entrepreneur: “I’m company X, and I’m here seeking \$350M for the development of AN/Monolith (V), the system you’ve specified. My company has over 25 years of experience in the development of systems of this type. We have several innovative ideas and approaches that we intend to apply to the program - ideas that we don’t have the VC to build or patent – as they are unique to this solution – and we lack the financial resources to build them. We hope that you select us to receive your VC and allow us to work with you to build a magnificent product for the warfighter.”

Shark: “Your experience is surely relevant and your price is the lowest. Do you have any intellectual property assertions to make?”

Entrepreneur: “I will provide IP assertions on my 7017 and 7018 table in accordance with the DFAR – as per your request.”

Shark: “So – I assume that all the new development – funded with Navy funds – will be provided with licenses that will allow me to share your IP with others, either on an unlimited basis or with Government Purpose Rights (which includes all of your peer competitors).”

Entrepreneur: “Yes – the product will be provided with IP assertions allocated to investment in accordance with the DFARS.”

Shark: “Deal!”

The entrepreneur, having secured the contract, begins to perform, with extensive oversight and guidance from the APM and the customer. Requirements are clarified, designs are produced, and software is developed. Some of the code turns out to be reuse from products built with Independent Research and Development (IRAD) funds, Small Business Innovation Research (SBIR) funds, as well as a variety of customized commercial components. As the complexity and diversity of products used to fulfill the requirement increased, the entrepreneur’s IP position—as the sole provider of this “software tapestry”—was enhanced (Figure 5).



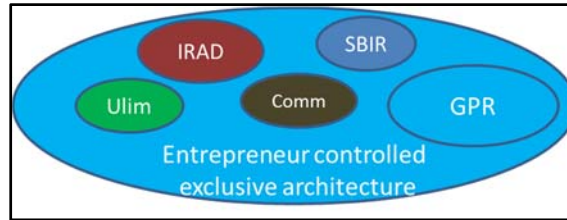


Figure 5. Software IP Tapestry

The delivered Software Tapestry is based on a design that tightly interweaves GPR components with limited-license components. It is disclosed only to the extent required in the contract. Proprietary elements, non-developmental items and products produced by Government expense are not identified uniquely and are, for all practical purposes, inseparable. As the development effort continues over many years, many technical and operational issues are addressed. The entrepreneur invests his IRAD dollars each year in adjacent areas, providing interwoven solutions to the Navy with associated license rights. The vendor uses his IRAD funds wisely to provide innovation, and to enhance the difficult tapestry so as to minimize the extent to which the IP for the entire product could be shared. When the system is “sold off,” it performs to specification—fulfilling the requirements and goals of the Navy. The product consists of a large set of software components with a broad mix of license rights.

Shark Tank Round 4: The Awkward State

We enter this round of the Shark Tank in an awkward interim state in which the Navy acquisition community wants to move forward toward an Open Systems Architecture Business Model—but recognizes that evolution to this business model is not a linear progression from the Legacy Model of Shark Tank Round 3. We are emerging out of monolithic designs and old-school acquisition approaches—toward open architectures in which systems are built as an integrated and federated set of severable modules.

The Navy APM (the Shark) needs to find a way to procure such a system—with an eye toward recovering at least part of the investment made in the monolith. The APM/VC therefore seeks a way to re-capture as much of the IP associated with AN/Monolith (V) as possible. The most powerful venue to establish this re-capture occurs in a competition that introduces a challenging set of competitive practices which pit the APM-venture capitalist and the Entrepreneur in a battle for IP license rights, a battle that could be avoided. The APM/VC issues a solicitation in which it intends not only to evaluate the technical merit of a particular solution, but also the extent to which the proposal includes claims of limited or restricted rights in IP.⁷ The APM/VC requires that each bidder provide a price for a license to each element of the solution to which the bidder asserts license rights other than GPR. Because the price of these options is going to be evaluated in the context of a fierce competition, the entrepreneur finds himself in a lose-lose position. He can offer the IP he had the exclusive ability to use at its real value (i.e., a high price) and risk losing the competition—or offer it IP at a reduced price (or perhaps for free) as a strategy to win this specific contract. In order to have the highest likelihood of winning this contract, the

⁷ Solicitations: Naval Sea Systems Command, N0002412R5315 for Air and Missile Defense Radar, N0002413R5100 for AEGIS Combat System Integration and Test, N0002408R6294 for Weapon Control System.



entrepreneur offers to yield a very broad license right for free. This is the very IP that formed the foundation of the business—and the basis for it being sustained as a going concern.

What are the potential long-term consequences of these actions? With the entrepreneur's IP in hand, a wide array of peer vendors will bid a labor force not burdened with the experts that created the intellectual property (cheaper labor force), in an attempt to beat the original developer in the subsequent competition (remember Obama's quote). Interestingly, the entrepreneur now needs to bid for the opportunity to continue to work on his own intellectual property against a competitor who does not need to bear the cost of employing the knowledgeable staff that created it. The entrepreneur's unique capacity to understand the design and make changes and upgrades to it (a capacity that drives up his labor rate) is frequently not a factor in subsequent competitions. The Government, selecting a new (lower cost) contractor to maintain and upgrade the IP, may find that they unexpectedly bear the high cost associated with re-establishing the intellectual capacity of a new labor force, a potentially costly and high-risk strategy.

Re-capturing IP using this business practice is possible for the APM/VC as our marketplace is a monopsony. The Government is the only buyer—a fact not lost on the bidders. Although the practice is legal, it runs counter to the spirit expressed by Lincoln and Obama. It seems to negate the notion of fueling the interest to spur the fire of genius.

Shark Tank Round 5: The SBIR Semi-Commercial Transaction

The SBIR model is an extremely important one as it prescribes several noteworthy business practices.

An Entrepreneur enters the Shark Tank ...

Entrepreneur: "I'm an entrepreneur seeking \$1M of VC to design and build a prototype of an innovative solution to a Navy capability described in your recent announcement. I am pleased that the Navy has modularized the design of AN/Monolith(V). It has segregated the technical architecture needs such that I can apply my innovative solution to that architecture. I'd be unable to bid on the entire monolith, but feel confident that I can produce a superior technical solution for you within the fixed SBIR funding made available."

Shark: "Thank you for joining us today. As you know, within the SBIR program, we further partition the role of the Navy participants. I represent the Navy's Venture Capital for innovative product development. I am separate from the Acquisition Program Manager and the fleet Customer. My goal is to spur innovation. In exchange for the benefits the Government gains by having small innovative companies, I will offer to you a special license that will protect you from the caustic IP environment of the non-SBIR defense market. The special license is called SBIR Data Rights. In essence, the rights provide that I can use the products of the SBIR within the Government, but I cannot share them with your competitors or use them as an artifact to a competition—for five years from the completion of your effort. I expect you to give me an innovative solution without fear that I will hand it to your competitors. I expect you to help me to commercialize this product by making it fit into an Open Systems Architecture product line established by my collaborating APM.

Entrepreneur: "I offer the following innovative technical solution...."

Shark: "Deal!"



The execution of the SBIR Phase I and Phase II efforts—to move from idea to prototype—is a small engineering effort. The Shark and the APM know that there is inherent risk in ideas and system development that provide great warfighting performance, and thus gives the entrepreneur great flexibility. Because the SBIR represents such a small piece of the now modular system, they know that failure is not catastrophic, while success is a great leap ahead in innovation. This deal is structured to ensure that the entrepreneur has every incentive to make this technology succeed and transition.

Table 4. SBIR Business Model

| | |
|-----------------------|---|
| Requirement/Need | Navy APM |
| The Idea/Approach | The Entrepreneur |
| The Market | Straight Forward Initial Commercialization of Small Module with Many Other Possibilities |
| Initial Investment | SBIR PM, Shared with Sweat Equity |
| Intellectual Property | License As Per DFARS 252.227-7018 |
| The Venture Capital | SBIR PM |
| Proposition | Very Small Revenue Earned as Percent of VC, Profit in Future VC and Derivative Product Line Markets |
| Shark (SBIR PM) Goal | Pseudo-Commercial Transaction, Limited IP License |
| Entrepreneur's Goal | Gain Entry into Business, Build Business, Provide Excellence |
| Customer's Goal | Warfighting Capability |

The Navy's partitioning of the VC role from the APM role in the SBIR program enables the provision of SBIR data rights. The Cost as an Independent Variable nature of SBIRs makes them centered on technical excellence, and not simply low cost for minimum acceptable performance. This is an extremely cost effective and inviting set of mechanisms that draws a vast array of entrepreneurs to struggle to out-innovate each other to provide the best solution to the warfighter.

A struggle currently surrounding the SBIR program is the cognitive dissonance between the desire of APMs to break vendor-lock and establish greater competition to save money and SBIR data rights that seem to conflict with this strategy. Unlike a patent term that commences on its filing data, SBIR data rights protect the IP for 5 years *after the program ends*—a loose definition that is subject to interpretation. This is an issue that needs to be resolved, perhaps in a manner consistent with Open Systems Architecture License Rights, as described below.

Shark Tank Round 6: The Open Systems Architecture Business Model

The Navy has established a strategy for evolving toward a set of OSA business and technical practices that, if followed, will change the nature of how systems are designed, built, and acquired.⁸ The evolution of software architectures has led us to a time in history where we can decouple the system infrastructure from the capability modules of the system as a set of coordinated business transactions vice contracting for monolithic designs.

Figure 6 is an artist's conception prepared by the Software Engineering Institute that captures the paradigm evolution in the development of complex software systems, migrating

⁸ Naval OSA strategy, retrieved from <https://acc.dau.mil/adl/en-US/695451/file/75899/OSABrochure.pdf>



from tightly coupled designs and systems that mirror the organization that built them to modular federated systems built in an open systems architecture⁹.

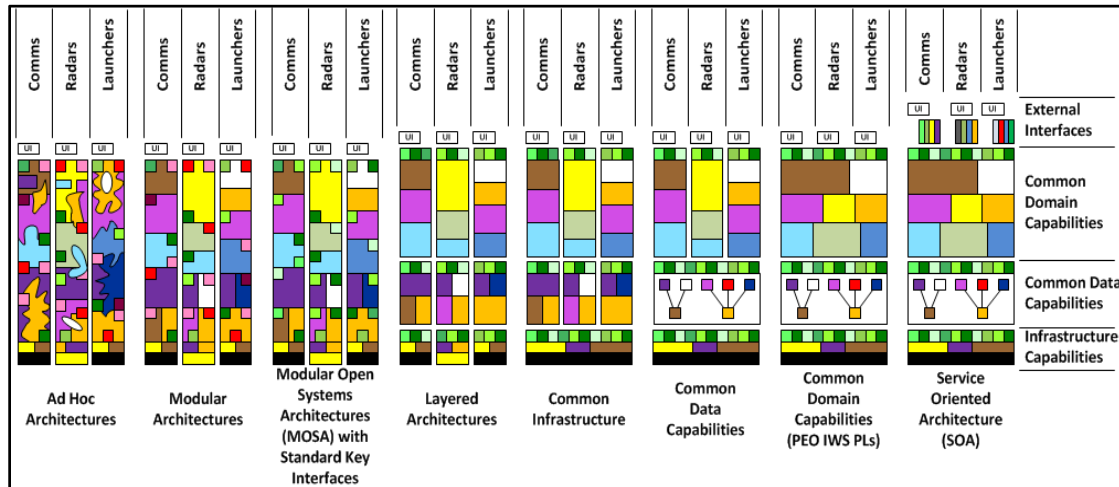


Figure 6. Transition of Software Architecture: 1970–2010

The Navy's Open Systems Architecture technical framework is analogous to the Apple® and Android® open environment, or the Ford Sync. The foundational system architectures are distinct from applications that can be acquired individually as smaller business modules. The Navy has endeavored to establish this type of system architecture across each of its mission areas, with initial success in USW Combat Systems, CANES,¹⁰ FACE,¹¹ Surface Combat Systems,¹² Unmanned Aircraft Systems Ground Control Segment (UCS),¹³ and others. The thing these programs have in common is that the Navy has established a technical foundation, with cooperation from industry, to establish a marketplace for components that can be acquired inexpensively and can be replaced risk-prudently.

⁹ <http://blog.sei.cmu.edu/post.cfm/architectural-evolution-dod-combat-systems-359>

¹⁰ <http://www.navytimes.com/article/20140128/NEWS04/301280018/Top-admiral-outlines-future-sea-information-sharing>

¹¹ <http://www.opengroup.org/face>

¹² https://acc.dau.mil/adl/en-US/332101/file/48591/Benedict_OA_19Nov.pdf

¹³ <https://ucsarchitecture.org/>

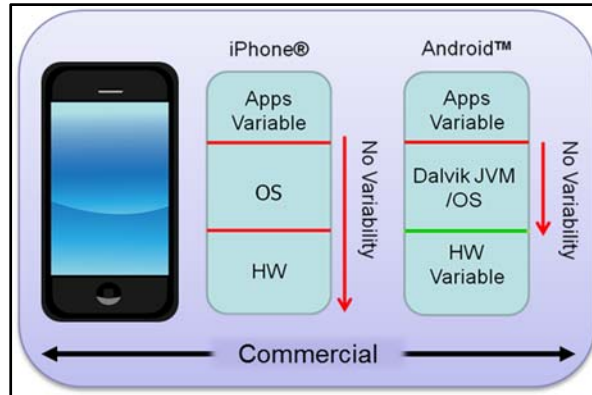


Figure 7. Apple and Android System Architecture

The Navy acknowledged its strategic business need to coordinate the development of technical architectures that would generate the business dynamics possible in a modern environment. This technical revolution enabled a commensurate revolution in acquisition, termed the Open Systems Architecture Business Model. This business model is a framework that can support a healthy relationship between the entrepreneur and the Shark.

We now propose a new IP strategy for DoD programs that is supported by a new “Open Systems Architecture License Right” (OSALR). The OSALR would be a mutually beneficial arrangement where the Government accepts limited, rather than unlimited or Government Purpose data rights, for the inner workings of the components of the system, while the entrepreneur accepts responsibility for providing or contributing to an open architecture. In this way a new win-win arrangement is established. The Government is freed of vendor-lock for monolithic systems in return for an open architecture in which components can be individually and competitively acquired. The Entrepreneur is able to market innovative products to a variety of customers without having to compete with an identical implementation of his or her creative work.

Let us now enter the Shark Tank for the final time with an Entrepreneur in the Modern Era, in which the OA business model has been adopted.

The APM in a modern Program Office has a new and balanced approach to component development and integration. He or she has a technology blueprint in hand. It organizes the technology requirements into a few (more than three, but less than a dozen) major pieces/modules. This technology blueprint, coordinated within a community of APMs across the Navy and DoD who want the same basic capability, provides a clean mechanism for reuse and expansion of modules using a product line approach. The product line approach makes it feasible to acquire some portion of a system from a pool of existing modules. Each component (or module) is acquired with a ‘technology excellence’ focus, utilizing a mechanism such as an SBIR contract or a Broad Agency Announcement that focuses on capability and excellence within a fixed budget.

The modules fit within an open systems architecture acquired using traditional acquisition processes (e.g., an RFP) along with integration and test services. The integrator may be one of the module providers or a different company.

The APM realizes that the modules of this open system need to be driven by the fire of genius and seeks entrepreneurial spirit to drive innovation. Some modules, acquired via the SBIR program, can be integrated with SBIR data rights. Other modules can be acquired using a BAA or similar contracting mechanism, using the program funds as VC (Figure 8).

Although the funding is not SBIR funding, the APM behaves like the SBIR Program Manager and offers to the entrepreneurs of these modules a specially negotiated license termed an 'Open Systems Architecture License Right.' OSALR mirrors SBIR license rights to great extent.



Figure 8. Modern Program Management Era

Based on our analysis of the mismatch of our interim state with a standard free market transaction, we propose that the OSALR includes the following general provisions:

- The Government may not release or disclose OSALR data to any person, other than its support services contractors, except as expressly permitted by the Vendor.
- The Government may use OSALR data for program purposes only.
- The Government cannot disclose the data outside the Government for a specified period of time subsequent to program completion:
 - Up to 10 years from initial contract award.
- The OSALR firm retains: "rights to data generated by the concern in the performance of an OSALR award."
- The Government will not use anything other than the external characteristics of the module (information associated with segregating it from the rest of the system or reintegrating a replacement) with OSALR rights to produce future technical procurement specifications.
- The Government receives a nonexclusive, royalty free license in technical data, but may not disclose them during the protection period, except for very limited purposes.

This arrangement will produce an ecosystem depicted in Figure 9 where the Government acquires a system that is comprised of severable modules that may be risk prudently replaced with competitive alternatives. A broad mix of IP licenses is supported and innovation from a variety of sources can be rapidly and affordably integrated and delivered. The module providers participate with the Government to establish and sustain the open architecture and associated data models that the modules need to perform and interoperate.

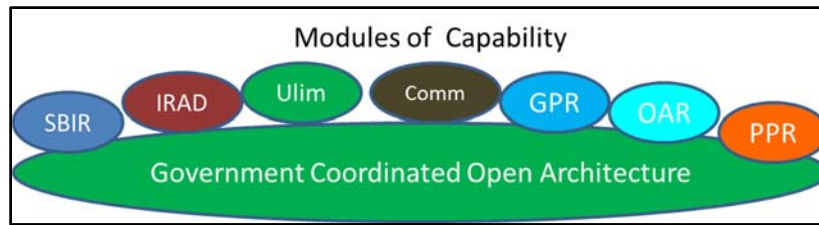


Figure 9. Open System Architecture With Modes of IP

Conclusion

The prosperity of our nation is driven by brilliant and hardworking entrepreneurs who convert their intellectual property into revenue in our free market economy. Abraham Lincoln understood that guaranteeing an entrepreneur’s ownership of his or her own intellectual property is the only thing that could add the “fuel of interest to the fire of genius”¹⁴ necessary to incentivize entrepreneurs to take the risks and provide the sweat equity necessary to make our nation truly prosper. The resulting commercial business cycle that interposes the entrepreneur, intellectual property rights, venture capital, and a vast and complex commercial market, has produced the world’s most innovative and extensive market place. The efforts of these entrepreneurs, when harnessed by the Department of Defense, built the world’s most advanced military. Their ownership and control of the intellectual property they develop in this business partnership is a continuing source of struggle, pitting a Federal Government, which needs to minimize cost using the mechanism of competition, against an entrepreneur who desperately seeks to protect his or her intellectual property to stay in business.

This paper examined the relationship between the entrepreneur, intellectual property, and venture capital in the commercial, Federal, and Defense market spaces using the metaphor of the Shark Tank television show. Some of our conclusions include the following:

- In the commercial market place, an entrepreneur has exclusive control of his or her IP. The Entrepreneur, the venture capitalist and the market are separate. The goals are typically to minimize VC for product development and to maximize profit in large volume production.
- An entrepreneur selling products to the Federal Government that are minor derivatives of a commercial product already in production (e.g., the custom x-ray devices for DHS) operates in a semi-commercial space. The entrepreneurs typically leverage anticipated Government requirements to acquire private VC that they use to develop a derivative product for the Government. Because it is private VC, the entrepreneur is not asked by the Government to yield any IP rights in the development of this new product. Typically, the goal is to minimize VC for development and maximize profit in large volume production.
- Entrepreneurs dealing with Legacy DoD operated in a very different environment. The DoD is a monopsony (single buyer) that served both as Venture Capitalist and Customer. Because the investment in monolithic

¹⁴ Lincoln

systems was so vast, the Navy required the entrepreneur to provide a license to share the knowledge of the inner workings of software products developed with Government's funds, such that they could use the competitive market space to achieve cost savings. This license arrangement incentivized entrepreneurs to provide a tapestry of software products with interwoven IP license rights; making competition difficult.

- We contend that the Navy is now in an awkward state as it transitions to a modern era and open business paradigms. As a monopsony, it exercises business leverage to strongly encourage bidders to price itemized IP that may be foundational to corporate viability in the course of a competition. This strategy may leave the entrepreneur in a lose-lose position.
- The SBIR Program provides a semi-commercial market environment for the entrepreneur. The Navy's SBIR Program Manager provides VC with favorable IP protections for the entrepreneur, incentivizing innovation at a fixed cost. The Navy retains an unlimited royalty-free license to use the product for Government purpose, but cannot release it to the entrepreneur's competitors until five years after the completion of the program, which may stretch on for many years beyond the original five.
- The Navy is implementing Open Systems Architecture technical models and Open Systems Business Models across the enterprise. These models make obsolete the legacy business notions in which we thought it was necessary to share one entrepreneur's IP with another to achieve excellence at the lowest cost. With the SBIR as our model, we herein propose an Open Systems Architecture License Right (OSALR). In the spirit of our free market economy, the Government can provide the "fuel of interest to the fire of genius" to the brilliant scientist and engineers who are our nation's entrepreneurs and who can build for us the next generation of superior Naval capability.

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