Modeling and Simulation Resource Reuse Business Model

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Outline

- **Problem statement**
  - **Barriers to reuse**
  - **Repositories as necessary but insufficient incentives**
  - **On the need for an M&S resource reuse business model**
- **Framework of a business model**
- **Focus areas**
  - **Laws and policies affecting intellectual property**
  - **Extending Tech Data rights to M&S resources**
  - **Mechanisms to support intra-government transactions**
  - **Measures to encourage open-source software**
  - **Improved discovery and distribution tools**

The Problem: Inefficient Use of M&S Resources

Few M&S resources are *re*used – either during a single program's lifecycle or across acquisition programs.

Tools	Data	Environment	
Models	Input datasets	Architectures	Network resources
Simulations	Scenarios	Interfaces	SME expertise
Federations	Threat data	Protocols	
	Algorithms		
Utilities (post-Processors)	Environmental info	VV&A templates	

Absence of incentives for M&S managers and developers is a contributing factor.

Reusable M&S resources generally contain *valuable* intellectual property

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- **Intellectual property refers to *creations of the mind*: inventions, literary and artistic works, and symbols, names, and images used in commerce.**
  - **In M&S the IP is often encapsulated in the source code and data sets**
- **DOD's access to M&S IP developed under contract is governed by both copyright law, patent law, and the procurement regulations contained in the DFARS**
  - **These laws affect the Government's ability to use, reproduce, modify, and release the resource to one or more potential users**
- **Control of IP is determined, in part, by who funded development**
  - **Government, Industry, or Mixed**
  - **But formal title is generally retained by the contractor-developer regardless of funding source**
  - **DoD acquisitions that involve a mix of government and IRAD funded technologies pose a challenge in determining control "rights"**

Barriers to M&S Resource Reuse

- Users lack awareness of reusable resources
- Insufficient details about reusable resources
- Hard to assess the true capabilities and limitations of existing resources
- Resources not in a form suitable for reuse
- Users lack trust in resources developed by others/ NIH
- Model is available but not the data
- M&S components don't work well together
- Repositories are incomplete and not current
- Little insight into how resources have been used in the past, including successfully and failures
- Difficult to access the actual resource
- Difficult to adapt existing resources to new problems
- No mechanism to compensate developer for resource investment and guidance on use
- No mechanism to protect developer from mischievous uses

M&S repositories, registries, etc. can be critical enablers

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If they …

- **Identify items that conform to quality standards and list pedigree**
- **Use a comprehensive, consistent, and well-structured taxonomy**
- **Include revisions, maintenance, and needed taxonomy updates**
- **Provide meta-data which includes semantics descriptors**
- **Include user-friendly search methods**
- **Are adequately funded / supported**
  - **-- including staff to match users with resources**
- **Require security to control access, but not onerous security**
- **Include motivation to resource providers to populate and update**

However, …

Improved M&S repositories could overcome some barriers

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But repositories alone are insufficient to motivate reuse:

- **Without incentives to populate, repositories will not include a comprehensive set of available resources**
- **Existing resources require additional work to adapt to new problems and support to guide their application**
- **Repositories often don’t facilitate the transaction to obtain the actual resource**
- **Repositories don’t protect the original developer from resource misuse by new users**

Project objective

- **Develop an economic business model that will make the reuse of M&S resources an attractive option for both consumers and providers of these resources**
  - **Identify incentives for consumers and providers**
  - **Establish how the transactions will occur**
  - **Identify funding and procurement policies and legislation that will need to be changed to put the reuse model into practice**

Project results

A business model would help to

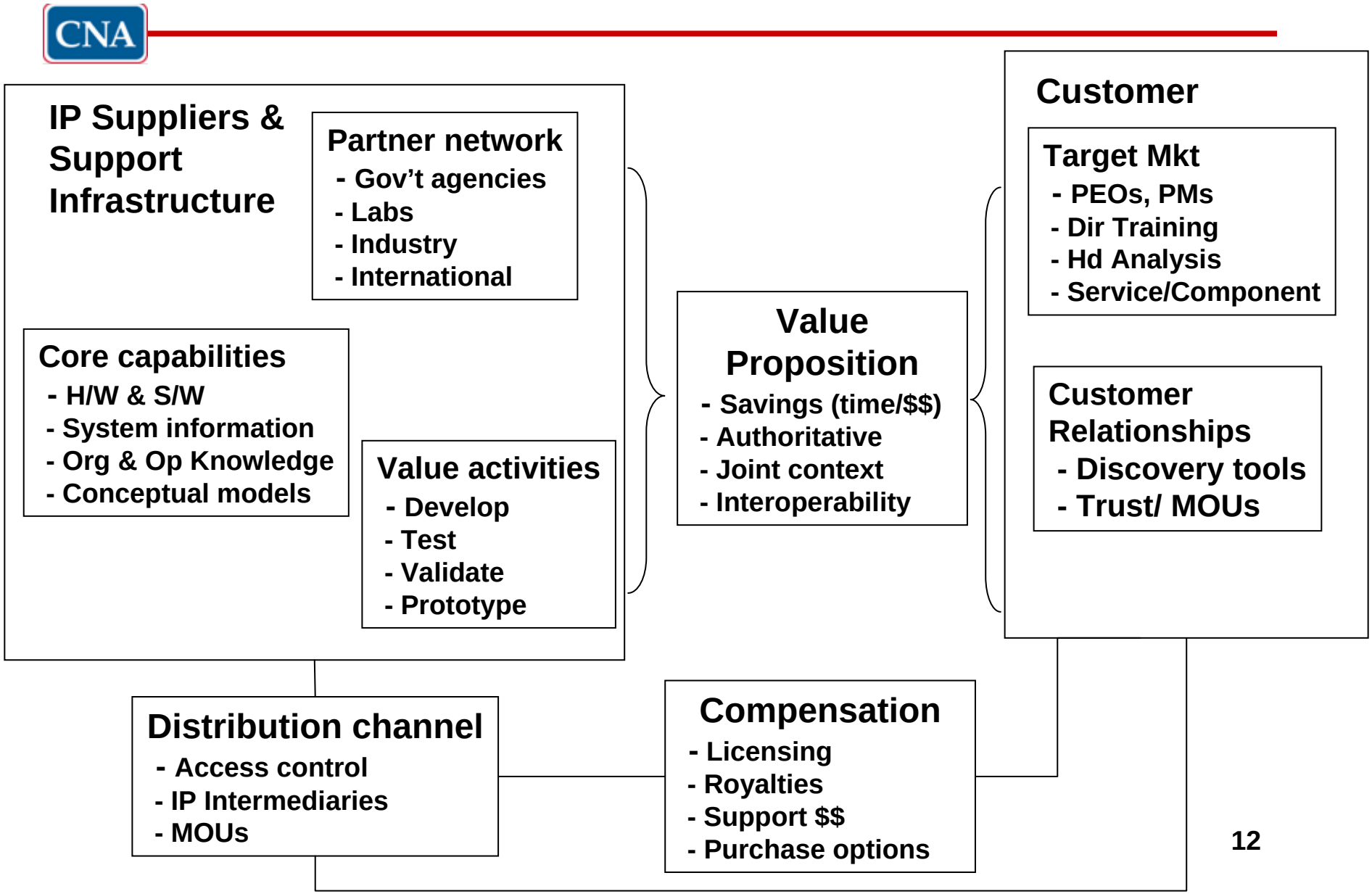
- **Promote competition in the market for M&S assets by allowing for appropriate access to resources owned or controlled by DoD**
- **Ensure that the producers of M&S assets receive a fair return on their investments**
- **Create an IT environment that breaks down barriers to collaboration, teamwork, NIH, … and encourages a longer-term planning horizon.**

Business Model Elements

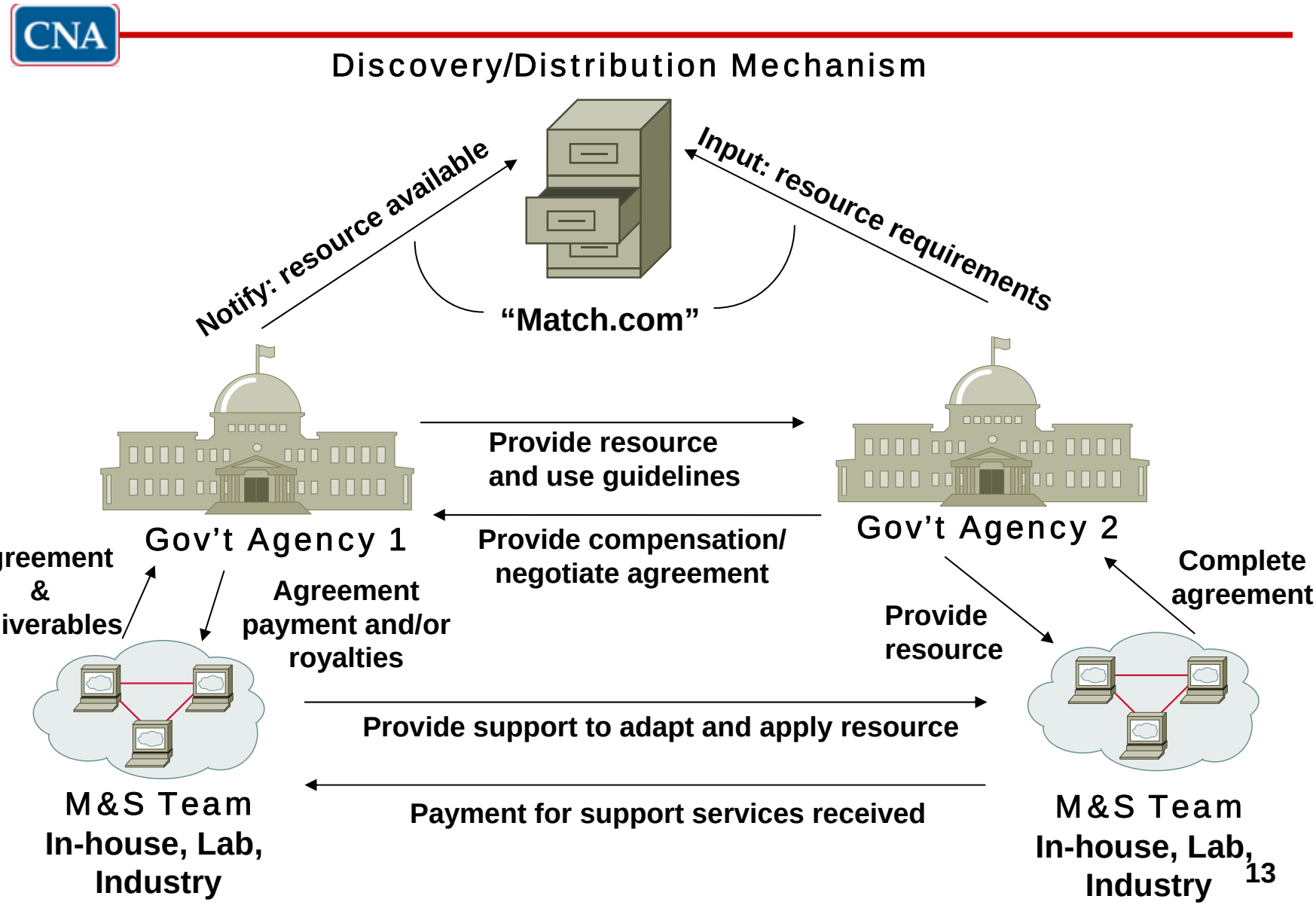
A business model would describe the

- **Value to M&S consumers produced by the ability to access and reuse M&S resources;**
- **The reciprocal value to M&S producers through transactions that result in the reuse of their resources;**
- **The capabilities, partners, and business processes required to create and deliver this value;**
- **The motivation, compensation principles, and policy necessary to sustain a mutually beneficial relationship between these entities**

M&S Resource Reuse Business Model



M&S Resource Transactions



Study findings *could* include recommendations on:

- **Extending Tech Data rights to M&S resources**
- **Mechanisms to support intra- government transactions**
- **Measures to encourage open-source software**
- **Improved discovery and distribution tools**

John Warner National Defense Authorization Act for FY2007

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Sec. 802. Additional Requirements Relating to *Tech Data Rights*

- **Section 2320 of 10 U.S.C. is amended by adding the following new subsection:**
  (e) The Secretary of Defense shall require program managers for major weapon systems and subsystems of major weapon systems to assess the long-term technical data needs of such systems and subsystems and establish corresponding acquisition strategies that provide for technical data rights …
- **Motivated by a need to develop alternatives to sustain systems over their lifecycle, including**
  - **Shifting maintenance to DoD and**
  - **Re-competing contracts for spare parts**
- ***Could be extended to include models, simulations, and associated databases developed and/or used in training, acquisition, testing, evaluation, and analysis of weapons systems***
- **Motivation is a desire to support upgrades to weapon systems**
- **Repositories like SHARE, originally established to contain computer software and tech data associated with combat weapon system, could be extended to include M&S software and associated data**

Federal Agencies as IP Intermediaries

- **NTIS as intermediary for IT and government publications**
- **NIH Office of Technology Transfer (OTT) as intermediary for IP developed by staff and/or grantees**
- **NASA Open Source Initiative as a distribution vehicle for software**
- **NASA IPP as intermediary for IP developed by staff and/or grantees (includes royalty opportunities for innovators)**

Examples of Gov-2-Gov Agreements

- **Inter-Governmental Service Agreements (IGSAs)**
  - **Immigration and Customs Enforcement (DHS/ICE) leases space in over 600 state and local jails and prisons in order to house alien detainees; the facilities used include both government-owned and contractor-owned institutions.**
- **Interagency Agreements (IAA)**
  - **Federal Occupational Health (DHHS/FOH) negotiates IAAs with federal agencies to provide on-site health care; services are provided by health care professionals working for FOH as independent contractors.**

Proprietary, non-commercial software poses obstacles to reuse

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- **Development environment restricted to internal ideas and internal technology**
  - **No reuse of the work from other organizations**
- **Often require NDA to look under the hood**
  - **NDA governs disclosure of models, source code, documentation, databases, drawings, know-how, formulas, processes, concepts, flow charts, designs, ideas, technical plans, …**
  - **Prohibits copying, altering, modifying, disassembly, reverse engineering, or decompiling the resource**
- **Can't transfer asset to a third party for reuse**

However, the absence of competition and potential for collaboration may lead to monopoly markets in niche areas such as DIME/PMESII

Open Source Software supports reuse

- OSS breaks through several barriers preventing reuse:
  - Not ready for reuse "Not invented here"
  - Components don't play nicely
  - Poor capability assessment
  - Insufficient detail & documentation
  - Difficult to access resources
  - Little info regarding past use
  - Incomplete and not current repositories
  - Resources hard to adapt
- Costs of OSS lower (transition, lifetime, support, upgrades)
- Open standards used in OSS support interoperability, and hence reuse
- Reusables tend to be abstract and harder to engineer. OSS patterns, which are recurring solutions to common software problems, help alleviate this and other reuse impediments.

Improved Discovery tools: Bringing M&S developers and users together

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	Catalog Access to IP Assets	Direct IP Distribution
3rd Party/ External Consolidator	**IP Search Engines** **IP Exchange Platforms**	**Publishers** **Resellers** **iTunes**
Non-Profit/ Government/ Self-Managed	**Library of Congress** **Library Consortia** **Fed. Tech Transfer Sites** **Univ. Tech Transfer Sites**	**Copyright Collectives** **Shareware, Open Source Software Dist.** **Federal Data Sources** **Non-Profit Organizations** **Software Escrow Agents**

External Consolidator, IP Catalog Access

- IP Search Engines
  - Cambia Patent Lens*
  - Delphion Research
  - Google Patents
  - PatentCafe
  - PIPRA*
  - Thompson Dialog
  - Thomson MicroPatent
  - Thomson Pharma
  - WIPO Digital Patent Library*

(*nonprofit organization)

- iTunes
- IP Exchange Platforms
  - BirchBob
  - Idea Trade Network
  - MVS Solutions
  - PharmaTransfer
  - TechEx
  - Yet2

External Consolidator, IP Distributors

- **Publishers**
  - **IEEE Xplore**
  - **Elsevier SciDirect**
  - **Nat'l Acad. Press**
  - **Lexis, Westlaw**
  - **Newspaper web sites**
- **iTunes**
- **Resellers of Copyrighted Material**
  - **JSTOR**
  - **EBSCOHost**
  - **Ingenta/Uncover**

Self-Managed, IP Catalog Access

- Library of Congress On-Line Catalog
- Library Consortia
  - Membership (ex: On-Line Computer Library Center, oclc.org)
  - Open access (ex: Washington Research Library Consortium, wrlc.org)
- Fed Tech Xfer
  - NASA
  - NIH
  - NIST
  - DoD, including IACs
  - Other Fed CRADA
- Univ. Tech Xfer
  - See Association of University Technology Managers (autm.net) for background

Self-Managed IP Distributors

Copyright collectives:

- ASCAP, BMI (in US)
- ALCS (in UK)
- JASARAC (in Japan)

Shareware Distributors

- Tucows, tucows.com
- PC Magazine/ Digital River, www.regnow.com

Open Source Software Dist.

- ossid.org (background)
- opensource.org
- redhat.org
- NASA Open Source Initiative, opensource.arc.nasa.gov

Federal Data Sources

- gpo.gov, thomas.loc.gov
- Bureau of the Census
- Bureau of Labor Statistics
- National Weather Service
- Department of Energy

Non-profits

- FFRDCs (sei.cmu.edu, CNA, RAND, IDA)
- "Think Tanks" (AEI, Brookings, Cato, Urban Institute, etc.)
- Constituency Organizations (Ex: eff.org, aarp.org)

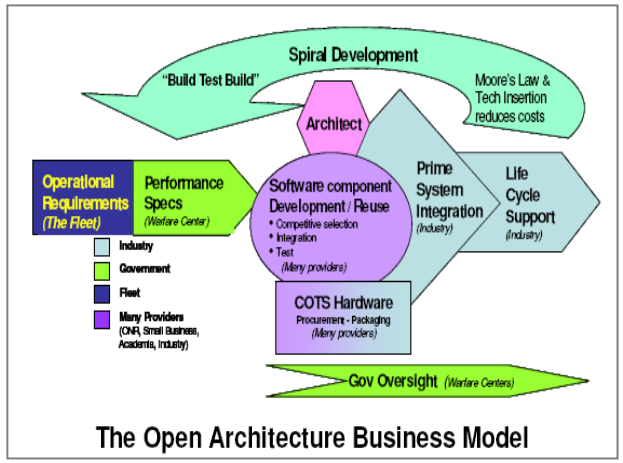
Escrow Agents

- Example: innovasafe.com

Summary: A business model takes reuse

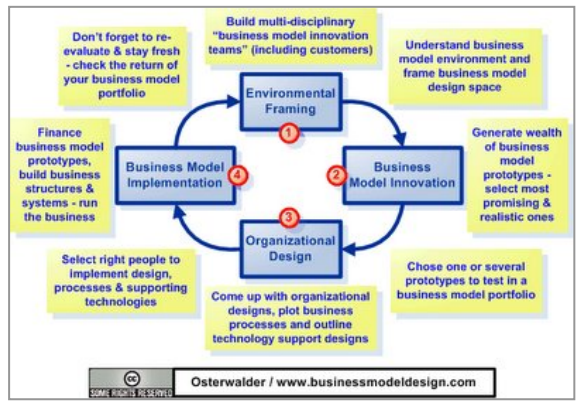
From Field of Dreams, To Government Contracting, To Business Viability

Build it and they will come…



The Open Architecture Business Model

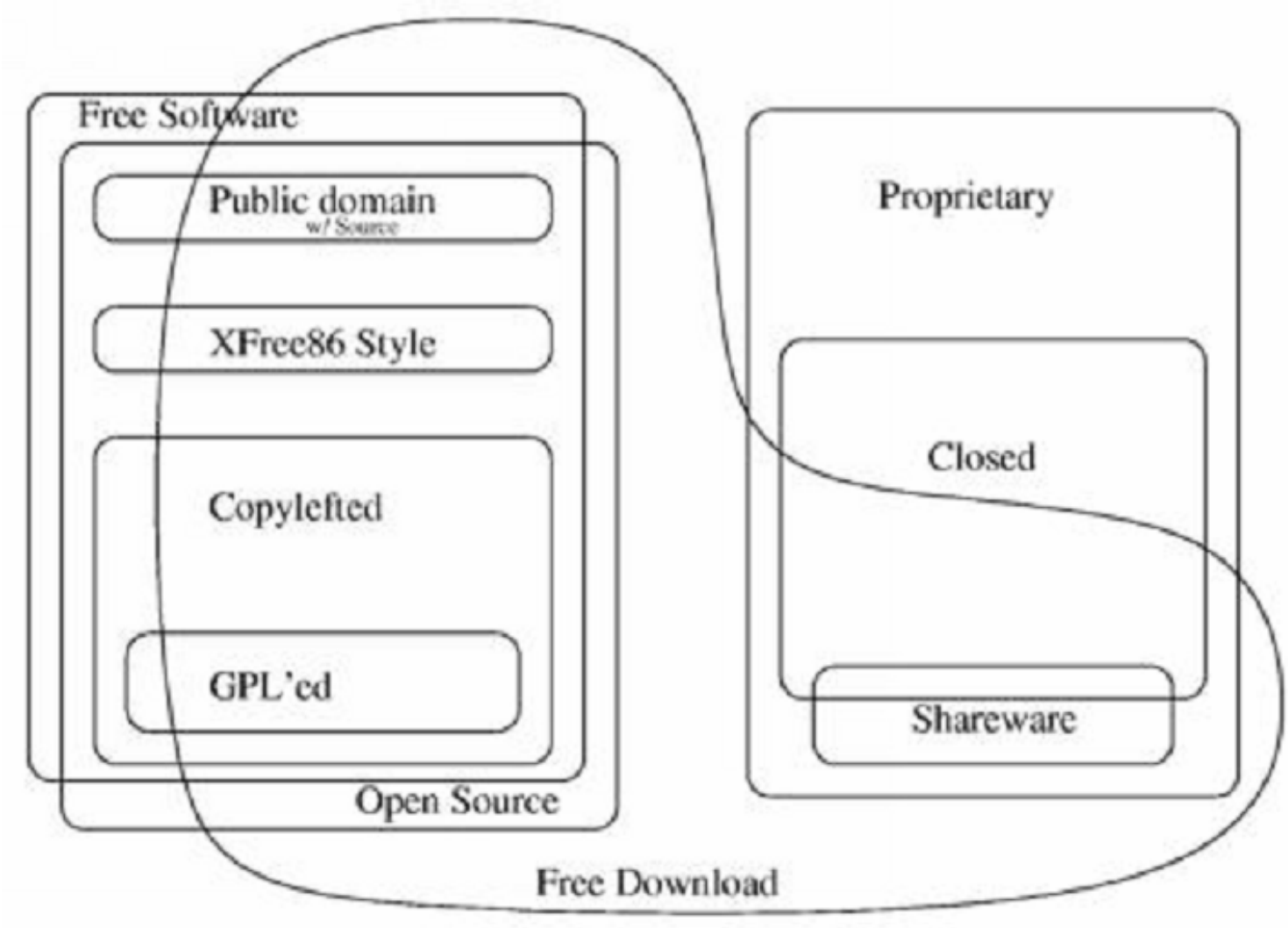
Make it work w/n DoD contracting…



Make it profitable for participants…

Backup

Software Copyright Overview



Exactly What is Open Source Software?

- **THE Open Source (partial) Definition:**
  - **Free redistribution (no royalty or fee)**
  - **Source code must be provided or made otherwise freely available, upon redistribution**
  - **Source code can be modified. Derived works can be redistributed under terms of original license**
  - **Same rights provided to all recipients**
  - **No restriction on other software bundled with the OSS**
- **Source code distribution is only required by GNU's General Public License (GPL) and Lesser GPL, and then only upon distribution of work derived from the original source.**
  - **So, OSS ok for sensitive/classified software!**

Open Source Software in the Private Sector

- **OSS is found throughout the private sector:**
  - **Apache (web server) , Linux, Java**
  - **MySQL (database)**
  - **Other middleware and internet infrastructure**
  - **Supercomputing clusters in academia (Virginia Tech, Penn State, Georgia Tech, etc.) running OSS**
  - **Parallel high-performance computing tools: OpenMP, Open MPI, MPICH**
- **Delta3D, Genesis3D, & Irrlicht engines, for 3D simulations and games**
- **IBM invested over $1B in Linux development and promotion**
- **Sun developed Star Office to compete with MS Office and then opened the source. The result is Open Office, which is MS Office compatible and uses the Open Document format also.**
- **Several other companies have sponsored or contributed to OSS: Boeing, Northrop Grumman, Novell**

Open Source in DoD

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- US Army is single largest install base of Red Hat Linux
- Open Source Software Image Map (OSSIM) project
  - High performance software system for remote sensing, image processing, geographical information systems and photogrammetry.
  - OSSIM (pronounced “Awesome”) currently deployed for commercial and government use… e.g. provides imagery to NASA and Google Earth, embedded in several classified and sensitive solutions in intelligence community.
- OneSAF: A simulation, training and instrumentation environment
  - Used by US Army and USMC (embedded simulation engine for US Army Future Combat Systems)
  - Virtually unlimited in creating virtual military environments.
- OpenEaagles: USAF simulation environment
- SubrScene: real-time simulation visualization toolkit.
  - Used by USAF for emersion in virtual environments for 3D fly-through

Other Federal Government Open Source Software initiatives

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- NASA - Has released over 20 open source apps
  - CosmosCode initiative: enlists volunteers to develop code for space missions
  - Supercomputer (one of world's most powerful) uses SGI Linux
- Navy Open Architecture - actively encourages open source and standards in acquisitions
- FAA saved $15M and 12 months switching to Red Hat Linux (from Unix) on air traffic control computers
- USAF, National Oceanographic and Atmospheric Admin. use SGI Linux.
- Army Future Combat System – uses Linux and open source simulation software
- Defense Medical Logistics Standard Support
  - Apache, OpenSSL, ModSSL, Stunnel
- Navy - Total Ship Computing Environment Initiative (TSCEI) runs on Red Hat Linux
  - Will support carriers, amphibious ships, destroyers, ...