

# **Modeling and Simulation Resource Reuse Business Model**

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# Outline

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- **Problem statement**
  - Inefficient use of M&S resources
  - Barriers to reuse
  - Multiple perspectives on reuse
- **Study approach**
- **Review federal laws, DoD regulations and policies on intra-government business transactions**
- **M&S may contain intellectual property**
- **Proprietary M&S and reuse**
- **Lessons learned from successful M&S reuse**
- **Framework for a business model**
- **Business model actions to spur reuse**

# The Problem:

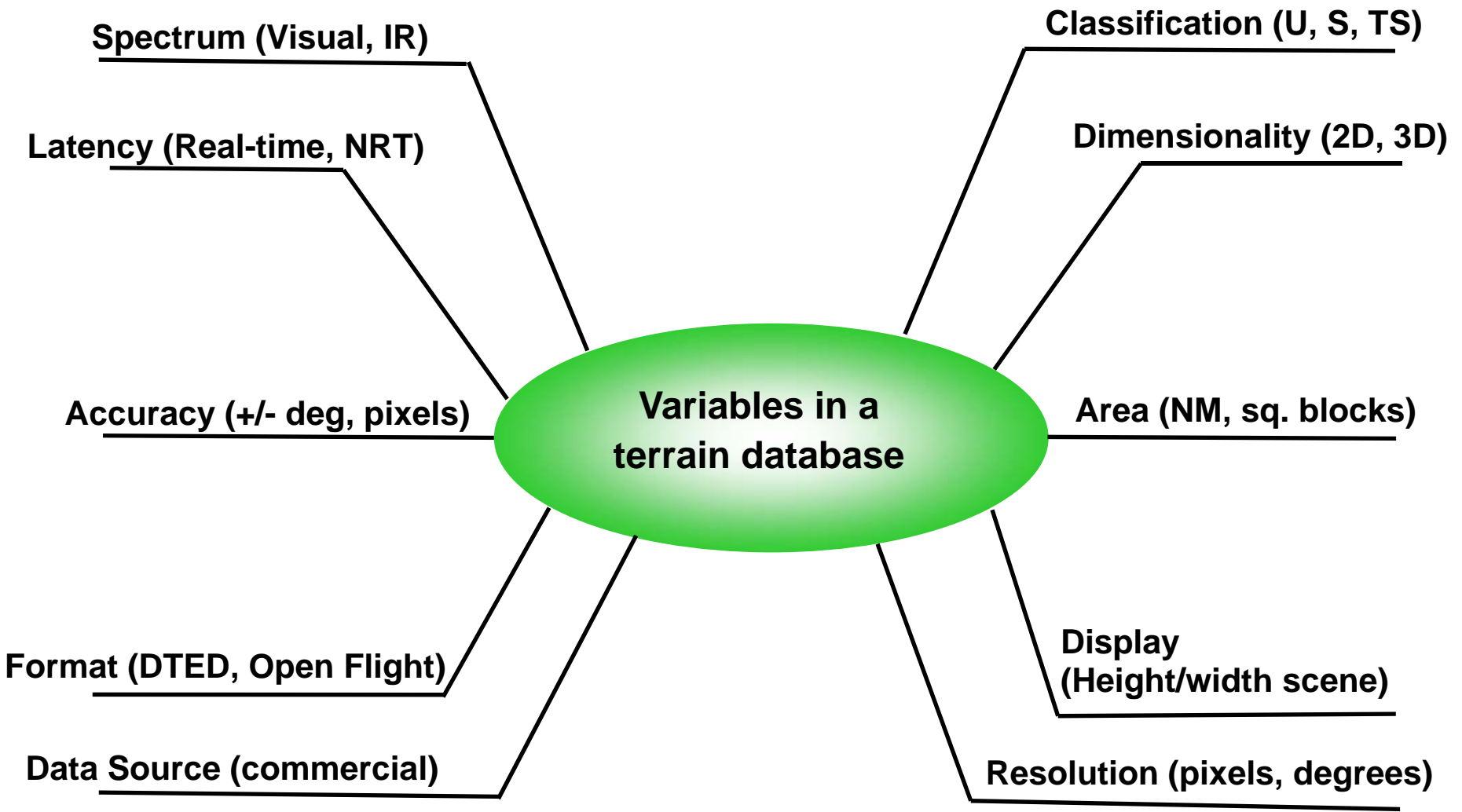
## Inefficient Use of M&S Resources

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

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

**Absence of incentives for Gov’t M&S managers and industry developers**

# Reuse doesn't mean necking down to a single model or database

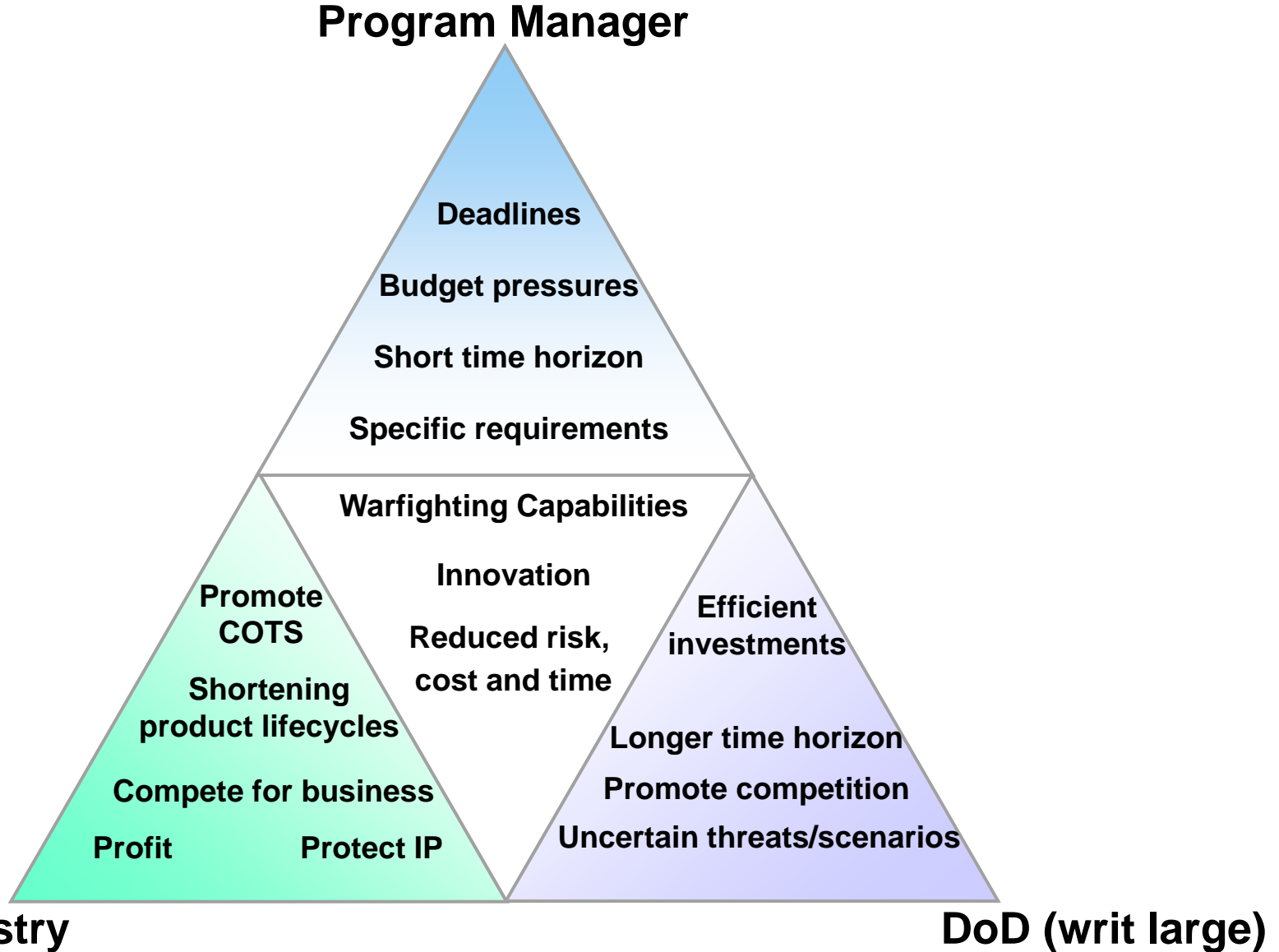


# Barriers to M&S Resource Reuse

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- **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**

# Multiple perspectives on M&S reuse



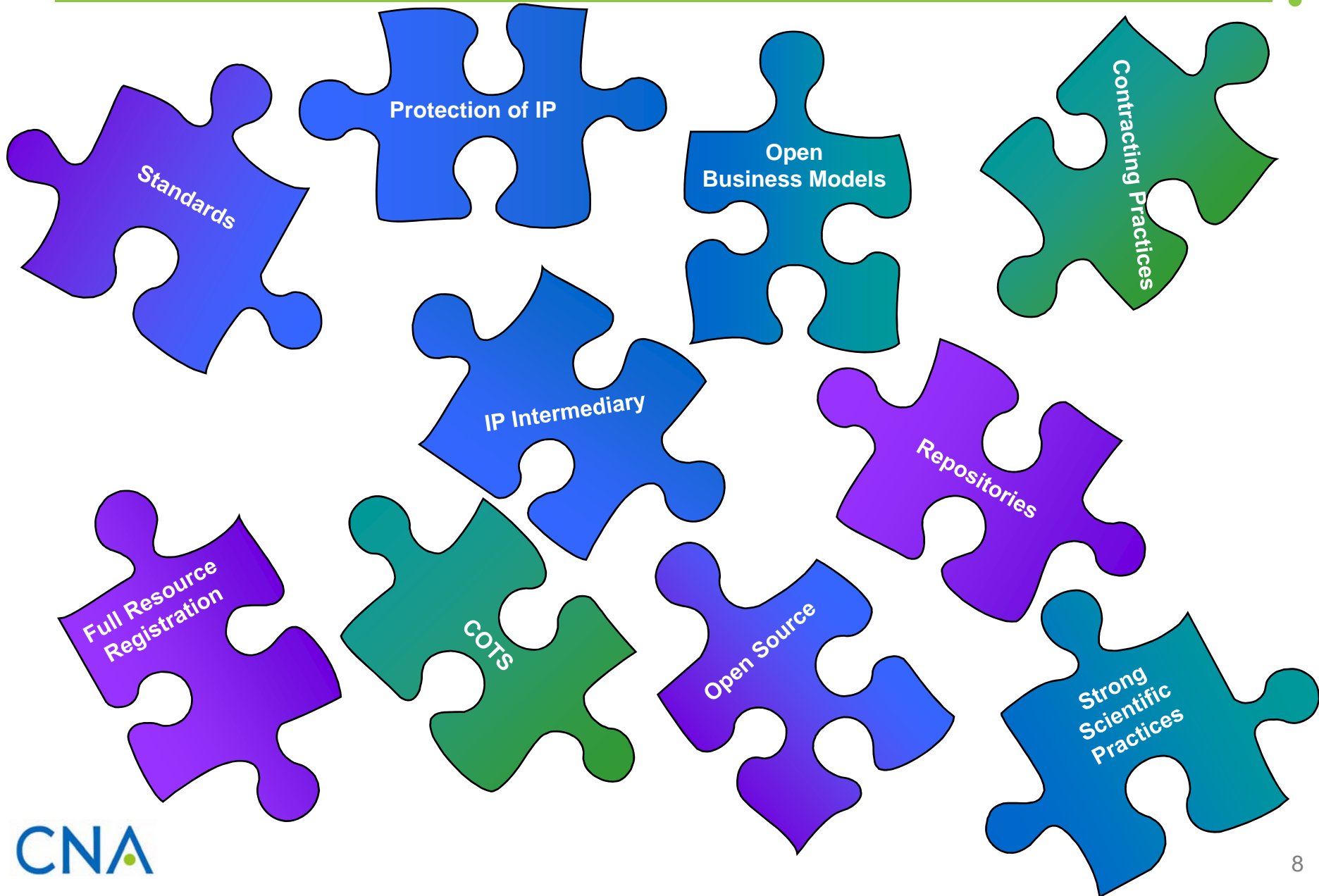
# Objective

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- **Develop an economic business model that will make the reuse of M&S resources an attractive option for both consumers and providers of resources**
  - **Puts the best M&S resources in the hands of users**
  - **Fosters collaboration and sharing**
  - **Leads to cost efficiency and minimal duplication of effort**
  - **Protects IP rights of industry**
  - **Ensures profitability of M&S industry**

# M&S Reuse Puzzle

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# Approach

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- Reviewed existing policy documents, DoD instructions, guidance, interagency agreements, FAR, DFARS, prior reports, ...
- Prepared case studies
  - SIMDIS, Linux, EADSIM, ICT, NIH/OTT, ...
- Used a variety of survey instruments, interviews, e-mail dialogue with industry and government
  - Where is reuse occurring today?
  - What “business factors” help to motivate reuse?
  - What are the challenges to reuse and how might these be overcome?

# Who we have spoken to:

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**Northrop Grumman**  
**Aegis Technology**  
**MAK Technologies**  
**PM FCS AD M&S**  
**NGA**  
**NAVAIR Portable Source Initiative**  
**OSD-JDS**  
**BreakAway, LTD**  
**MSIC, DIA TMAP**  
**USJFCOM J9**  
**USAF Common Data Set**  
**M&S EA (Ocean, Air&Space, Terrain)**  
**IWS General Council (SEA00)**  
**Pitch Technologies**  
**MMA M&S**

**Boeing**  
**Soar Technology**  
**Lockheed Martin**  
**MOVES/NPS**  
**Metron**  
**NAVMSMO**  
**JSF M&S**  
**IWS M&S**  
**USN IWS SHARE**  
**SAF/XC**  
**OPNAV N814**  
**NRL**  
**JASP**  
**MSIAC**

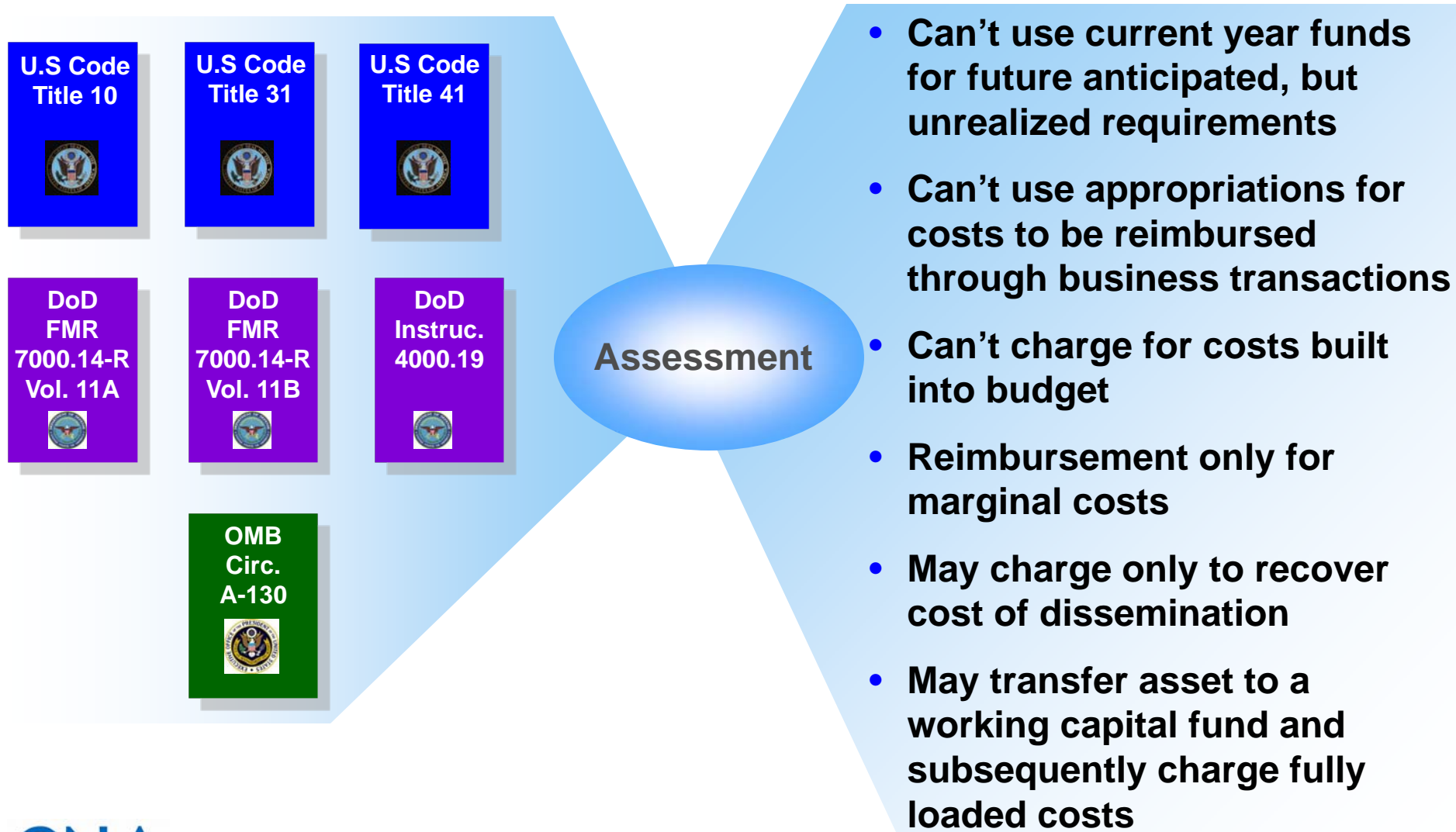
# Key issue for a business model

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**Under what conditions can a DoD program manager or other government official invest in M&S today**

- to satisfy both current and future requirements,
- including perhaps requirements of another yet unknown government user,
- Including additional investment to make the M&S resource reusable,
- and be compensated in a future intra-government business exchange?

# Federal laws and DoD regulations affecting intra-government business transactions



# Interagency Acquisition of M&S

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## Servicing agency

- (1) Existing GOTS or COTS with Gov't Purpose Rights**
- (2) Same as (1) + Gov personnel or contract support**
- (3) Same as (1) + model enhancements**
- (4) COTS M&S with license requirements**
- (5) New M&S with joint requirements**

## Requesting agency

- (1) No compensation allowed**
  - Congress has appropriated funds to servicing agency
  - No increase in support supplier's costs
- (2) Fund incremental cost of labor**
- (3) Fund model enhancements**
- (4) Fund incremental license fees**
- (5) Jointly fund new M&S**

# M&S resources often 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"

# Proprietary M&S and reuse

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- **COTS provides DoD with access to leading-edge M&S that otherwise would not be available**
- **COTS supports a broader market than DoD and thus capabilities should continue to improve over time**
  - **But a challenge to maintain legacy systems**
- **COTS enables “agile” M&S investment decisions by eliminating long-term O&M**
- **Developer may earn a short-term monopoly**
  - **Until the next wave of innovation**
- **Decouple the M&S from the original developer?**
  - **Yes-- a source license and/or tech data rights will promote 3<sup>rd</sup> party competition and encourage DoD to develop in-house talent to extend the M&S**
- **DoD may also require source license simply to “look under the hood”**
- **Enterprise license may reduce overall DoD costs of COTS**
- **Decision on negotiating for source or enterprise license depends on reuse potential (and willingness of developer)**

# Lessons learned from successful M&S reuse

Keep within a small, well-informed community

- V&V guides use
- MOU if needed

Keep within a small, well-informed community

Rely on standards

- V&V
- database formats (OpenFlight, Shape, GeoTIFF)

GPR license and proper Sys Eng to reduce costs

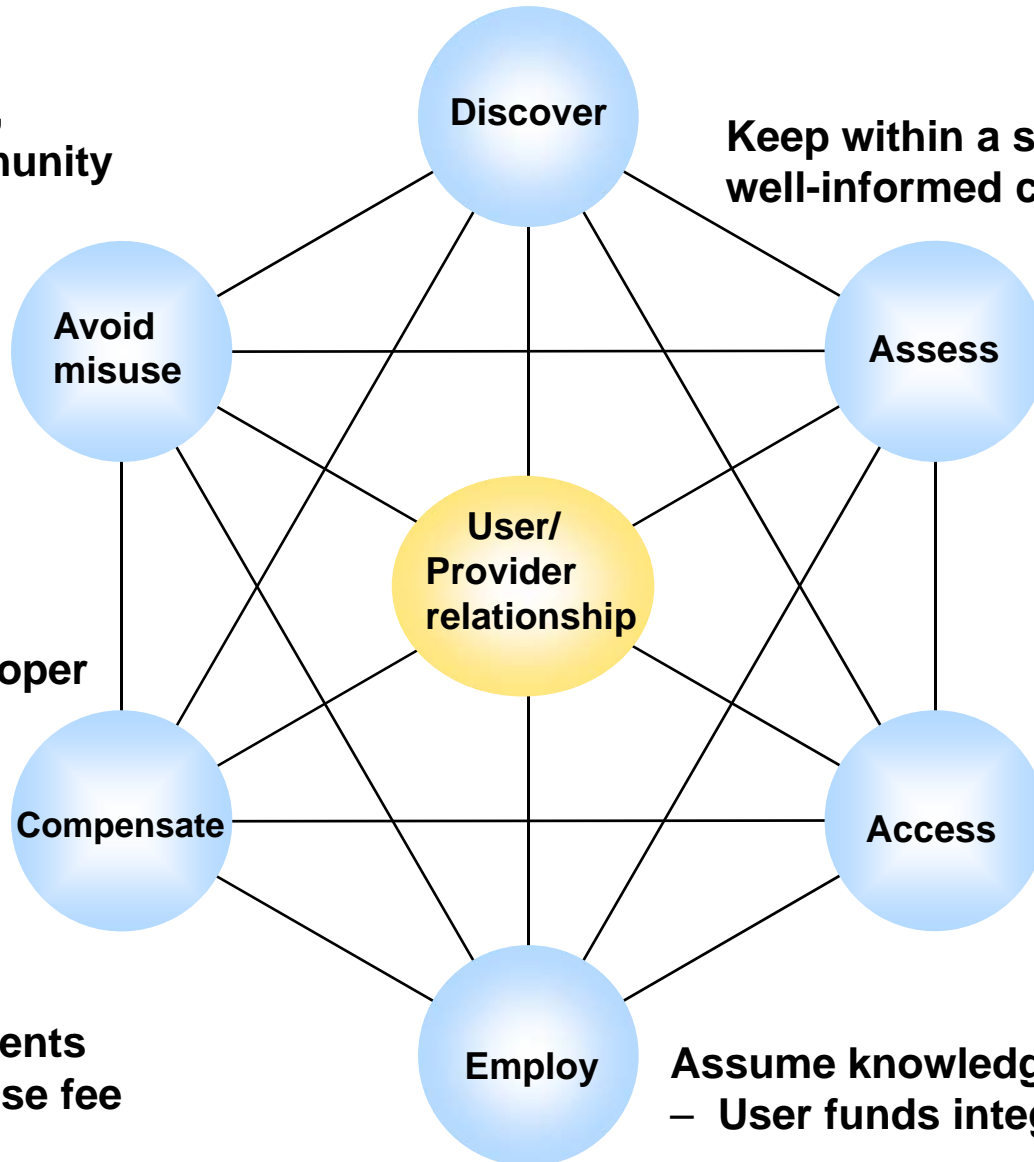
Government Purpose Rights

MIPR to cover Additional costs:

- Personnel
- Model enhancements
- incremental license fee

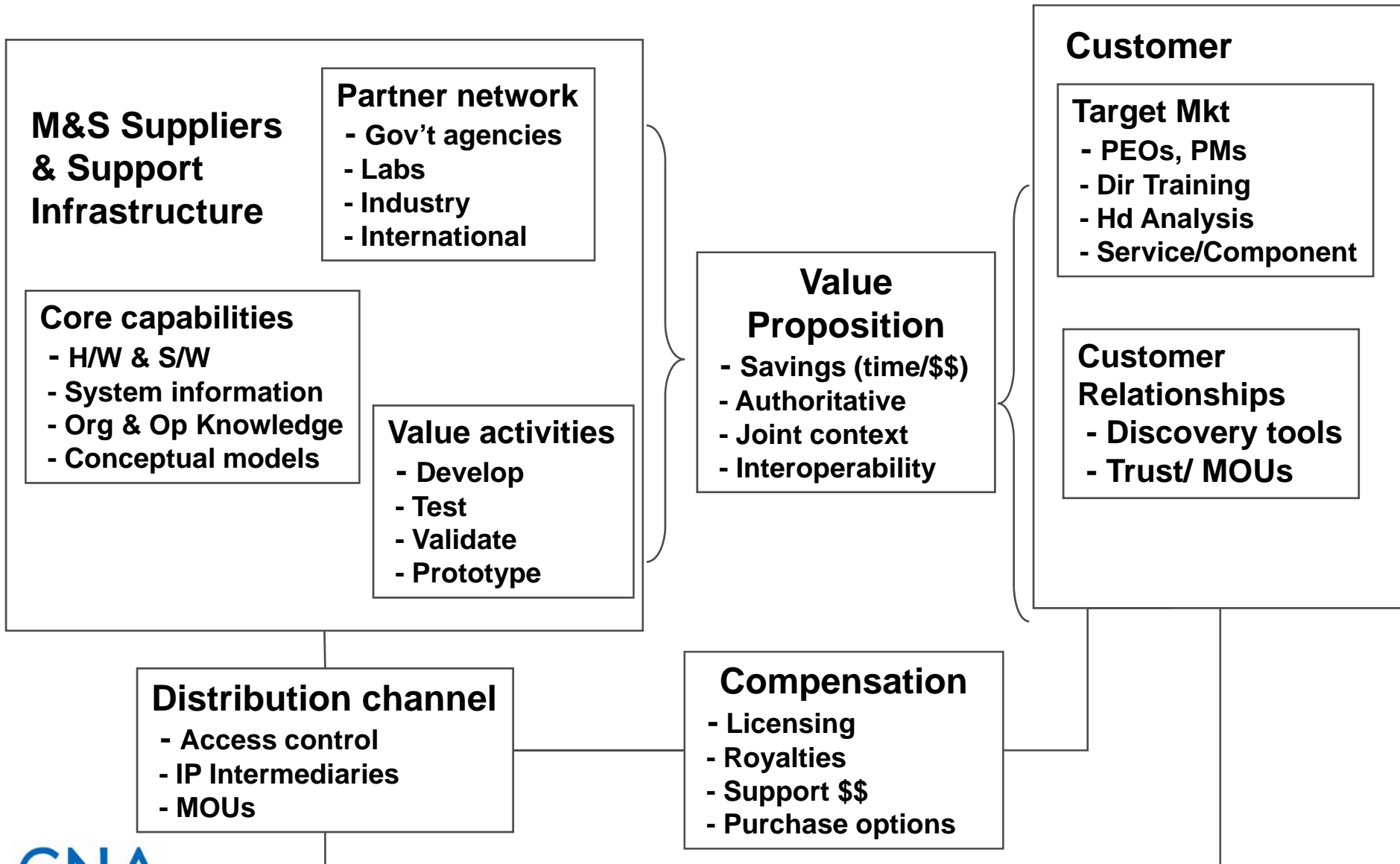
Assume knowledgeable user

- User funds integration

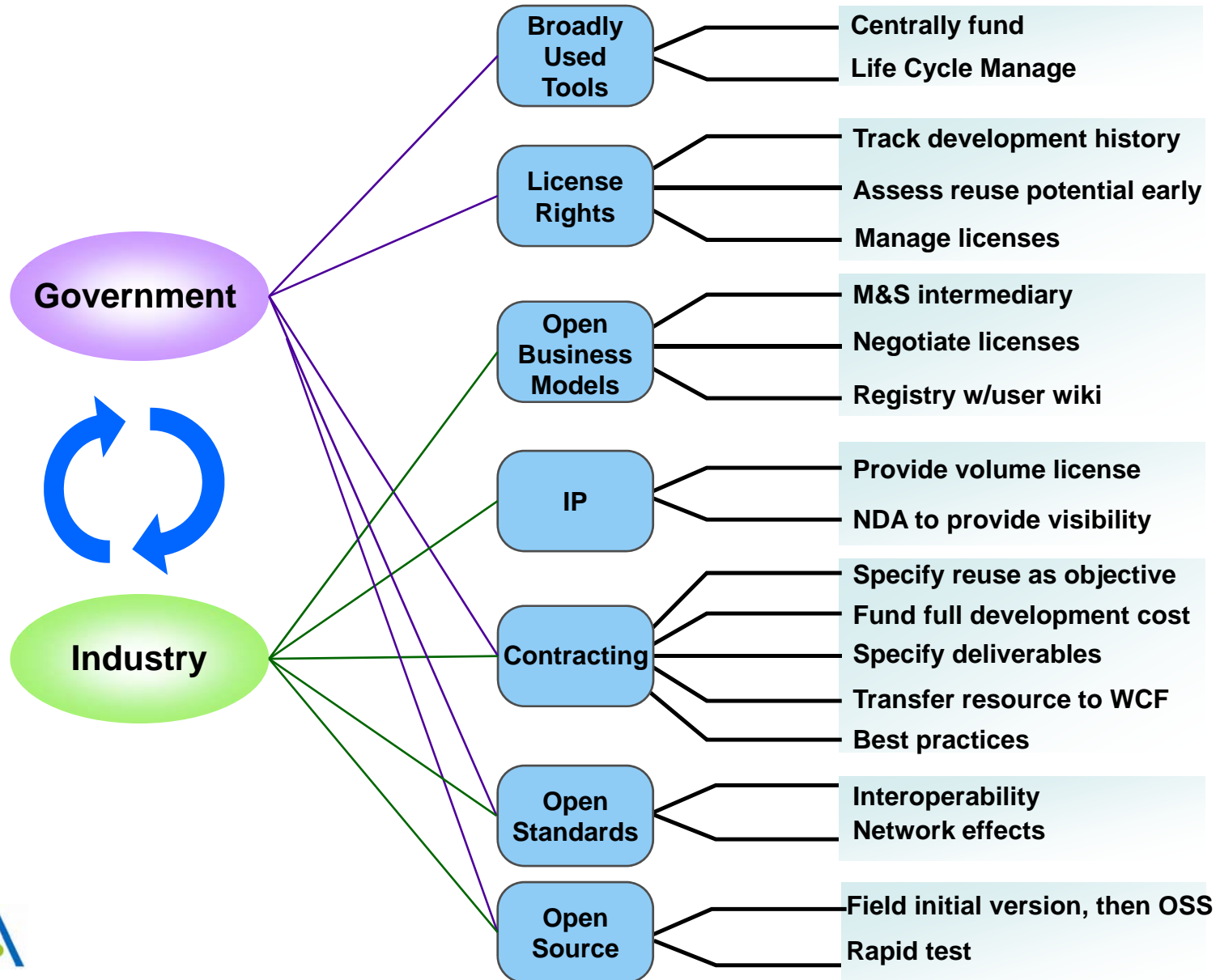




# M&S Resource Reuse Business Model



# Business model actions to spur M&S reuse



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# Backup

# Business model actions that will spur M&S reuse (1 of 7)

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- **Improved contracting practices**
  - Specify software, tech data, documentation as a deliverable
  - Price contract to include full cost of making M&S reusable (licenses, documentation, V&V, interfaces, ...)
  - Include expectations for software reuse in solicitations (and incentives for achieving reuse)
  - Implement stronger oversight of M&S development process
    - When was it developed and who paid for it?
    - Is contractor entitled to restricted or limited rights?
    - Standard contract language requiring GPR on all datasets
  - Require registration of all M&S resources (with metadata)

# Business model actions that will spur M&S reuse (2 of 7)

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- **Implement improved training for contract officers and program managers**

## Contract Officers

- **Goals and strategies for M&S reuse**
- **Form and function of alternative deliverables:**
  - **Computer programs, source code, object code, algorithms, flow charts, computer databases, documentation, etc.**

## Program managers / DoD decision makers

- **Goals and strategies for M&S reuse**
- **Software licenses and tech data rights:**
  - **Unlimited, limited, restricted, government purpose, commercial license, nonstandard rights**
- **Negotiating strategies**
- **Develop a “Best Practices Guide” for contracting M&S resources**

# **Business model actions that will spur M&S reuse (3 of 7)**

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- **For broadly used GOTS M&S, use central funding to make the resource reusable and to manage Life Cycle Costs**
  - **No single organization can be responsible**
- **Similar approach for common databases**
  - **Environment, threat models, scenarios, current and future forces (Blue, Red, White)**
- **Negotiate volume or enterprise license for proprietary M&S**

# Emerging tenets for an M&S business model (4 of 7)

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## M&S intermediary to create a secondary market

- Patterned after IP intermediary (Innovation Xchange, InnoCentive)
- Functions as an honest broker
  - Helps PMs locate suitable M&S resources
  - Helps developers find a market for established M&S resources
  - Independent of developers and users – Free to sign NDAs
- Documents legal status of each M&S resource within DoD
- Facilitates license agreements
- Manages tiers of licenses across DoD
- Builds and maintains the knowledge base
  - How resources have been used in the past
  - V&V histories
- Handles MOUs to guide appropriate use and avoid liability

**Virtual collaboration through electronic registries alone will be insufficient to achieve desired levels of reuse**

# **Business model actions that will spur M&S reuse (5 of 7)**

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- **Establish enablers for open business model transactions for both government and industry**
  - Register reusable M&S assets (Gov't and industry)
  - Include license rights
  - Include info on previous applications
  - Allow user-wiki comments on experiences with the M&S



# **Business model actions that will spur M&S reuse (6 of 7)**

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- **Explore the transfer of reusable M&S resources to a working capital fund (e.g., major test range)**
  - **Compensate M&S provider with test range services**
- **Develop methods to assess downstream and cross-program reuse potential**
- **Adopt strong scientific practices to ensure credibility of M&S products**

# Business model actions that will spur M&S reuse (7 of 7)

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- **Promote the use of open source software**
- **Grant industry access to approved government models and databases**
- **Add reuse as performance objective for Gov't stewards of M&S funds**
  - Examine registry/repository first
  - Fund to make new M&S reusable for others
- **Pursue balanced acquisition strategy**
  - M&S COTS with tier-based licenses, GOTS, GPR, and proprietary non-commercial where needed
- **Publicize DoD M&S reuse objectives and strategy)**
  - Use keynote address at conferences/ articles in trade journals and professional societies