



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

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| Report Documentation Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                            | Form Approved<br>OMB No. 0704-0188          |                                    |
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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
- **M&S contain intellectual property**
  - Laws and policies affecting IP
- **Framework for a business model**
  - Critical elements
  - Examples of how M&S transactions might take place
  - Government and industry roles
- **Next steps**
  - Industry/Government summit on a new business model

# 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                 | Threat data                      | Protocols          |                   |
| Utilities (post-Processors) | Algorithms<br>Environmental info | VV&A templates     |                   |

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

# 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

# Improved M&S repositories could overcome some barriers



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# But repositories alone are insufficient to motivate reuse:



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- Without incentives to populate, repositories will not include a comprehensive set of available resources
- Without incentives for reuse, repositories will be underutilized
- 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
- Developers must be compensated to make resources reusable and to shift business model from resell to reuse

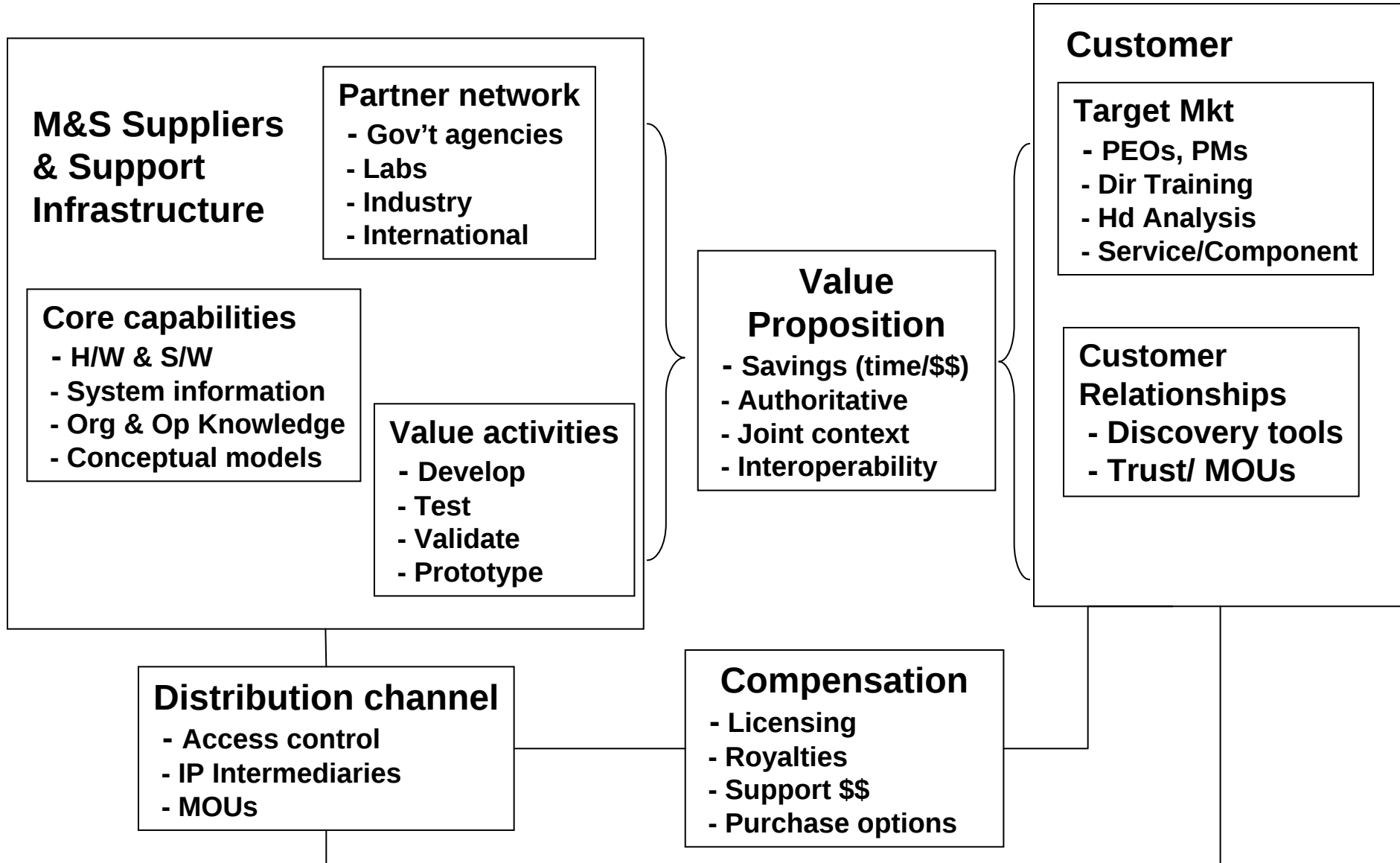
# What is a business model?



A business model describes 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 resources generally contain valuable intellectual property



- 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"

# ***Default DFARS rights: Contracts for software***



|                            | <b>100%<br/>Government<br/>Funded</b> | <b>Mixed<br/>Funding<br/>Sources</b>      | <b>100% Private<br/>Funding</b>       |
|----------------------------|---------------------------------------|-------------------------------------------|---------------------------------------|
| <b>Commercial</b>          | N/A                                   | Same rights as<br>standard<br>license     | Same rights<br>as standard<br>license |
| <b>Non-<br/>Commercial</b> | Unlimited<br>rights                   | Government<br>purpose rights<br>(5 years) | Restricted<br>rights                  |

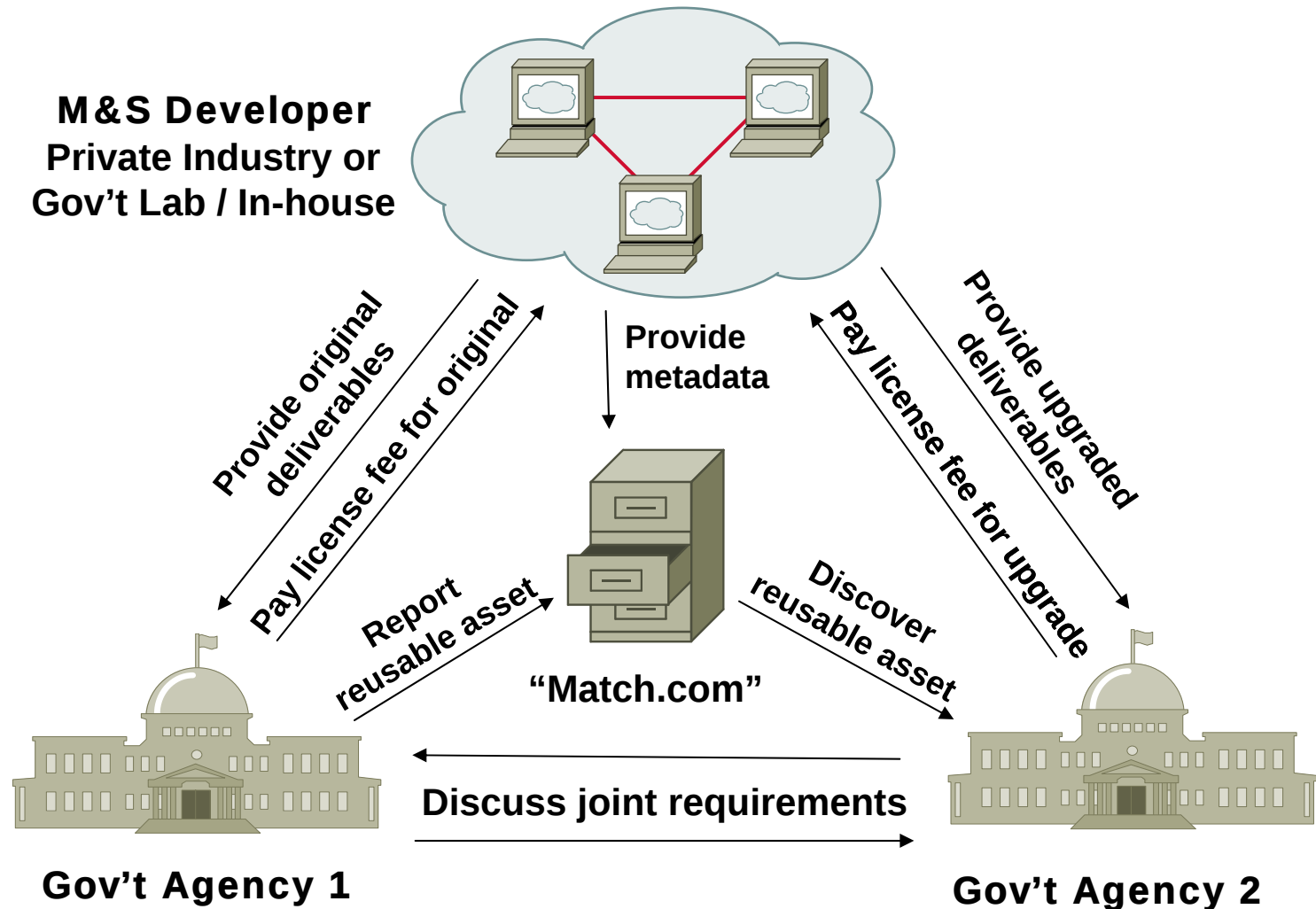
# ***Default DFARS rights:***

## **Contracts for technical data**

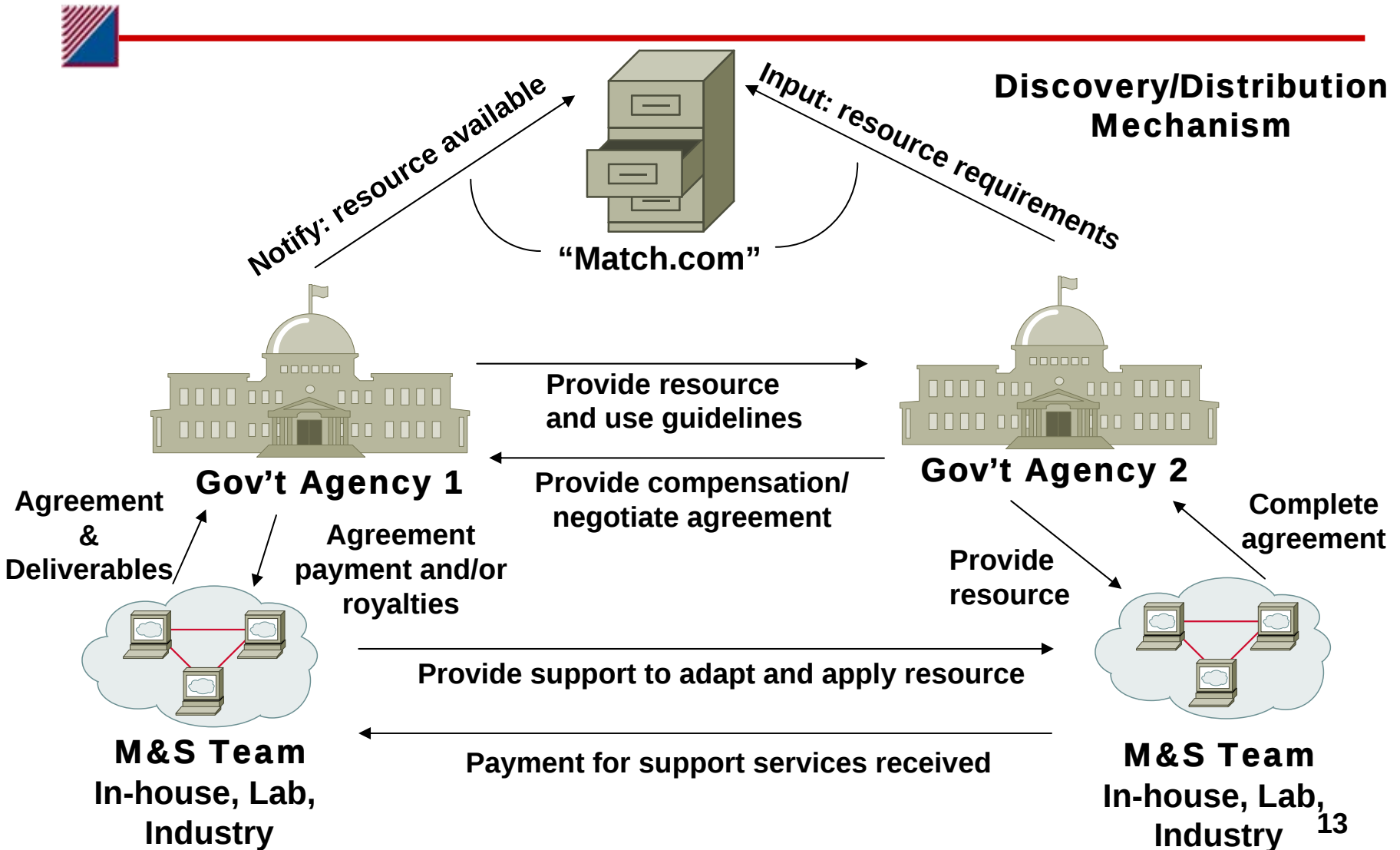


|                            | <b>100%<br/>Government<br/>Funded</b>                                                     | <b>Mixed<br/>Funding<br/>Sources</b>      | <b>100% Private<br/>Funding</b> |
|----------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------|
| <b>Commercial</b>          | Unrestricted gov't rights for unmarked data<br>Qualified gov't purpose use for other data |                                           |                                 |
| <b>Non-<br/>Commercial</b> | Unlimited<br>rights                                                                       | Government<br>purpose rights<br>(5 years) | Limited rights                  |

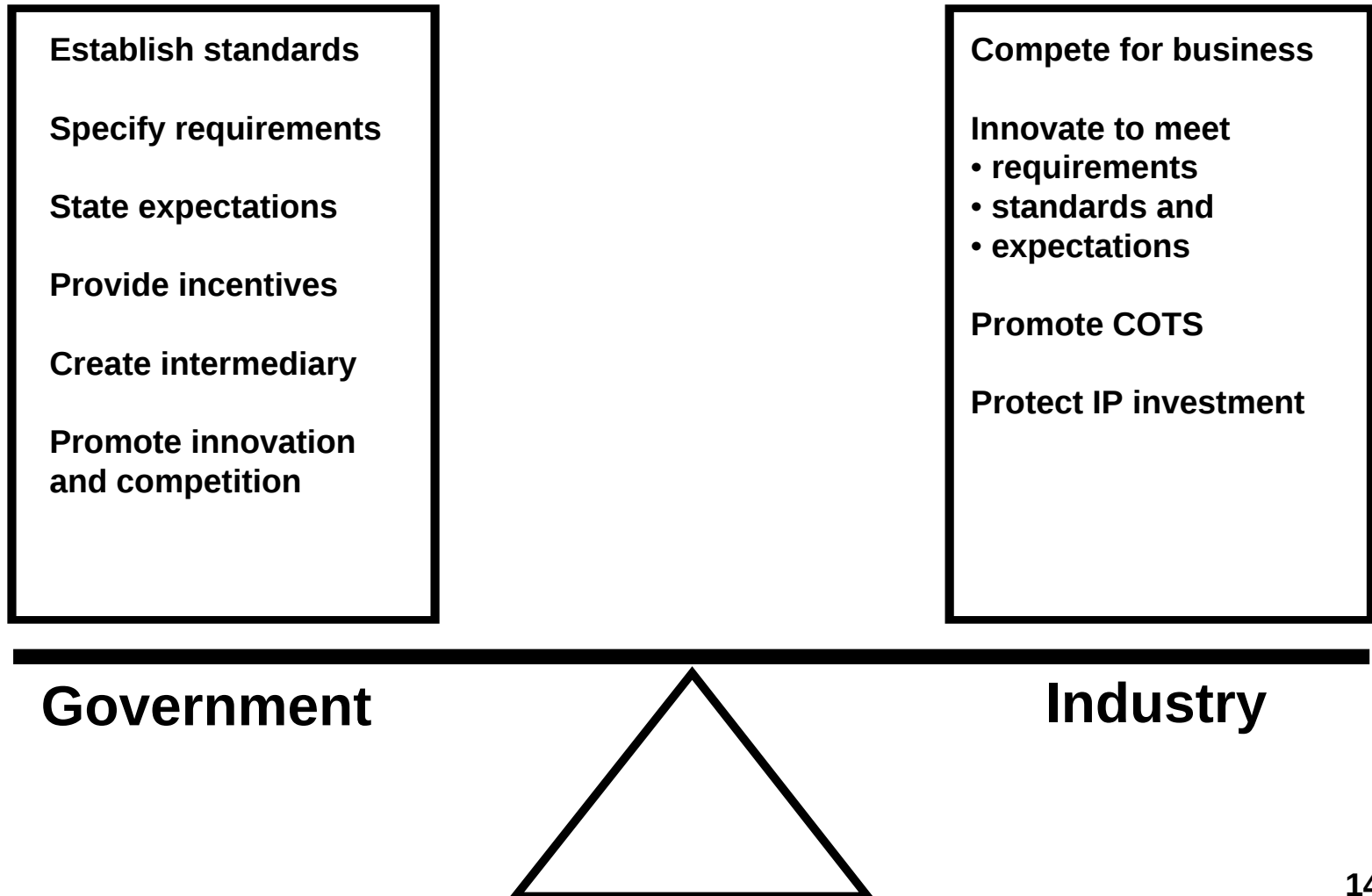
# Possible M&S Business Model



# Another Business Model View



# Seeking a Balance



# Government role in a Business Model

## (1 of 3)



- **Develop improved contracting practices**
  - Specify software, tech data, documentation as a deliverable
  - Fund full cost of making M&S reusable (documentation, VV&A, interfaces, ...)
  - Include expectations for software reuse in solicitations (and incentives for achieving reuse)
  - Implement stronger oversight of M&S development process
  - Require registration of all M&S resources (with metadata)

# Government role in a Business Model

## (2 of 3)



- **Develop methods to assess downstream reuse potential**
- **Define criteria for reusability and assess new M&S against criteria w/metrics**
  - **Add criteria to discovery metadata**
- **Adopt strong scientific practices to ensure credibility of M&S products**
- **Publish specific open standards and common data formats that all must follow**
- **Apply “IP Intermediary” to bring together providers and consumers in a competitive market**

# Government role in a business model

## (3 of 3)



- **Create incentives for program managers**
  - Overcome NIH and become open to external ideas
  - Fund full cost of achieving reusable M&S products
  - Form alliances with other program managers
  - Share program-funded resources and collaborate across government
- **Promote the use of open source software**
- **Grant industry access to approved government models and databases**
- **Pursue balanced acquisition strategy**
  - M&S COTS with enterprise licenses, GOTS, GPR, and proprietary non-commercial where needed

# Industry role in a business model

(1 of 2)



- **Recognize and embrace interdependencies through open business models**
- **Estimate the “value” of M&S products to include true cost of development and maintenance to make the resource discoverable and reusable**
- **Adopt strong scientific practices and rigor to establish credibility of M&S products**
- **Document and register M&S resources, including metadata**

# Industry role in a business model

(2 of 2)



- **Develop and distribute M&S consistent with government business model**
  - License copies, including enterprise licenses
  - Provide M&S for a fixed fee with unlimited rights
  - Distribute broadly at low cost (or free for open source) and sell supporting services
  - Enter into service agreements that provide access to M&S assets (industry retains exclusive rights and control of IP embodied in the M&S assets)

# Private Incentives with Public Management

## Government's Role



Little



Significant

- Publish standards
- Require resources be registered
- Provide incentives
- Use market-driven approach that brings together users and providers

- Invest in common goods
- Broker alliances
- Assess products for potential reuse applications
  - Fund investments to achieve reuse
- Guide new users to existing resources
- Manage enterprise licenses
- Retain software contract deliverables for reuse

# Next steps: Forum for Shaping a Business Model



- One-day summit
- Invite industry and government representatives
- Potential scenarios:
  - M&S support to an acquisition program
  - Shaping tools for analytic agenda
- Potential Issues:
  - Rights in M&S software and databases
  - Commercial wargaming and non-proprietary M&S??
  - Alternative M&S business transactions
  - Shared infrastructure
  - Promote both innovation and competition