# RedLion

## An Infrastructure to Enable Crowd-sourced Design and Collaboration for Complex Defense Applications

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# The needs of crowd-sourced hardware

- Design of cyber-electro-mechanical systems vs the design of software
- Ensuring data provenance while enabling sharing
- Concurrent design and how to ensure design intent across distributed design teams with versioning
- Semantic search, discovery, introspection and linking of design artifacts
- IP-rights and varying governance models
- Multi-classification level enclaves

# Hardware vs Software Design

- Hardware designers are not software developers
  - What does synthesis and sizing mean for software?
  - Formal design languages such as SysML only now beginning to be leveraged in Hardware design
- Hardware systems are not the same as software systems
  - Hardware designs are merely abstractions of the system
- Different tools, different artifacts, different needs

# Ensuring data provenance while enabling sharing

- Data provenance is a key enabler to help ensure IP rights
- Knowing the provenance of the artifacts and data associated with any project enables better reuse metrics
- Strong data provenance and version control supports the verification stages of systems design

# Concurrent design and how to ensure design intent?

- Software developers use integrated unit testing to ensure design intent in collaborative development
- Integrated unit testing for hardware design would, in general, require automated execution of engineering codes
- Ideally each designer would be able to use a different suite of tools

# Semantic search, discovery, introspection and linking of design artifacts

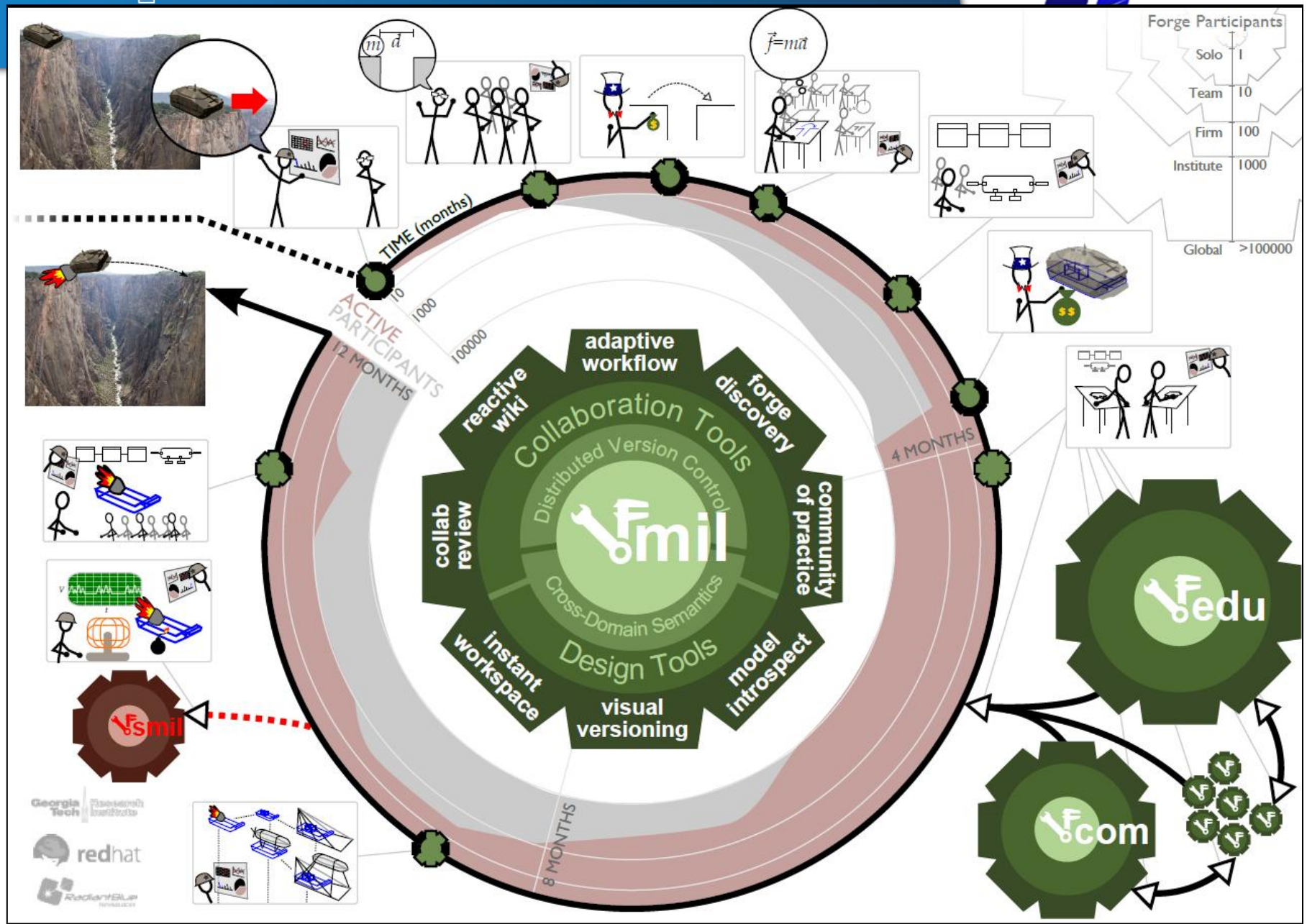
- Interface oriented design for hardware development is not generally supported in code integration tools
- Semantic linking of codes/artifacts enables tool agnostic design and development
- Semantic search and discovery enables better re-use and faster differentiation across possible solutions

# IP-rights and varying governance models

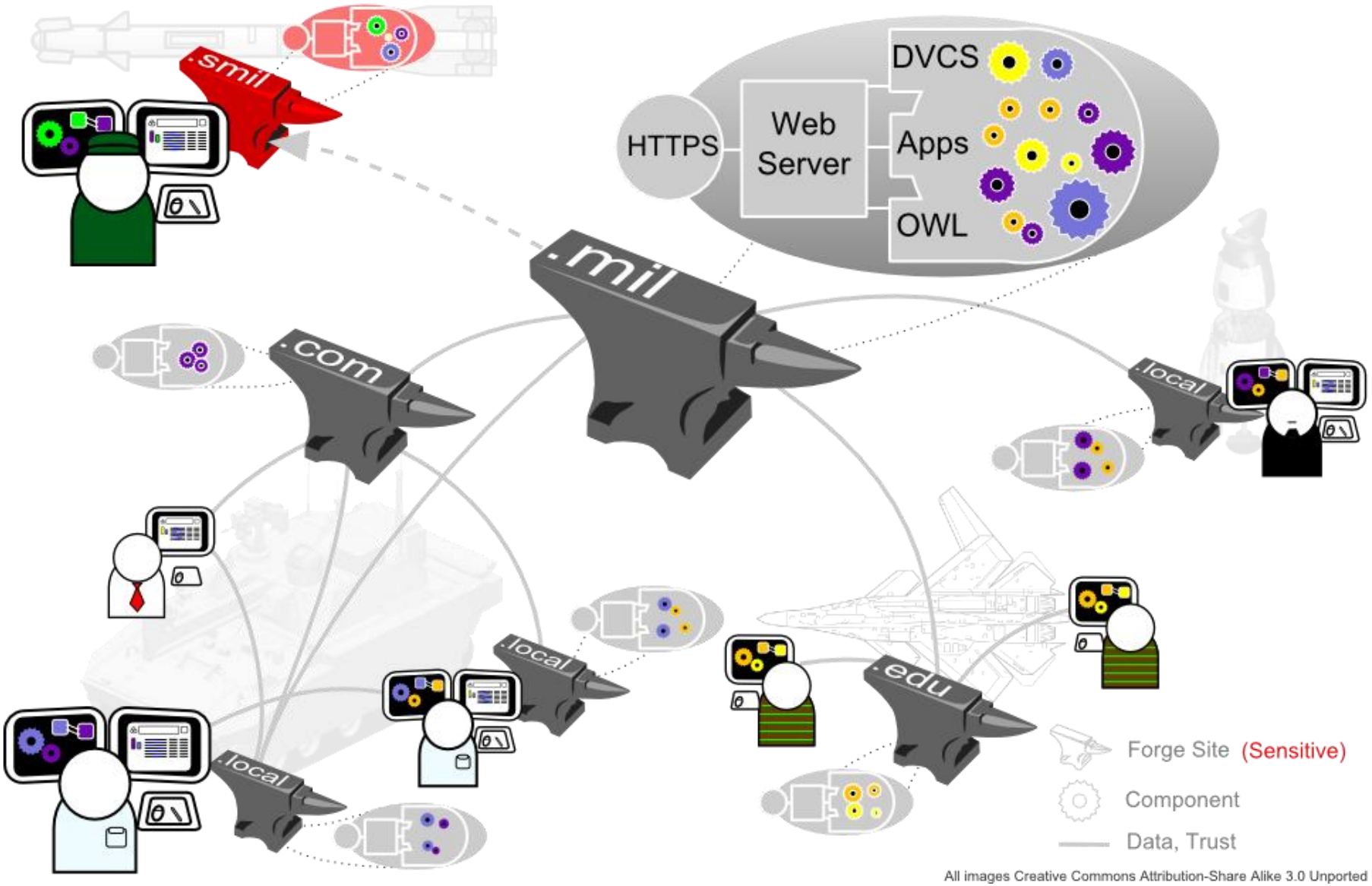
- Why IP-rights and governance is Important
  - Well-understood ground rules make it easier to gain participants in the short term.
  - A vibrant collaborative hardware community reduces costs and eases maintenance for everyone.
  - Limit confusion and liability.
- Hardware IP management is different than software
  - Hardware governed by patents
  - Software by copyrights
  - Open source hardware usually not patented

# Multi-classification level enclaves

- Open -> Proprietary -> ITAR Controlled -> Classified
  - Ideally information/designs would seamlessly flow from low to high but have strict controls in the other direction
  - How to ensure US citizen status for open yet ITAR controlled projects?
- The whole goal of the AVM project is to enable a 5x reduction in time to develop military vehicles


Forge Participants
Solo 1
Team 10
Firm 100
Institute 1000
Global >100000
TIME (months)
ACTIVE PARTICIPANTS
12 MONTHS
4 MONTHS
8 MONTHS
10
1000
100000
adaptive workflow
forge discovery
community of practice
model introspect
visual versioning
instant workspace
collab review
reactive wiki
Collaboration Tools
Distributed Version Control
Cross-Domain Semantics
Design Tools
fmil
fedu
fcom
fsmil
redhat

# VehicleForge.mil Concept



# What is RedLion?

- A web-centric framework to enable collaborative hardware design
- Built on the enterprise-grade, open source technology stack used on 30k projects by 300k users on SourceForge.net
- Bootstrapped by $1.4M in DARPA funding to support the Adaptive Vehicle Make program and accredited to subset of NIST 800-53
- Open source (MIT License variant) and fully extensible and customizable

# Required Software Components

## Core Services

Web Server Stack
DVCS & WebDAV
Cryptographic Services
Indexing Engine
Index Search

## Component Interoperability

Basic Data Ontology
Semantic Triple Store
Semantic Search

## Extensibility

App Engine
Hook Script Engine

## META Integration

SysML App
AADL App
Modelica App

## Designer Collaboration

Wiki with Forums
Integrated Chat Client
Tasking App

# What does RedLion Do?

1. **Revision control**: git, mercurial, rug, svn, ...
2. **Federated search:** forge-to-forge, global, project
3. **Change tracking**: ticketing, branching, merging, artifact/asset diff
4. **Collaboration:** wiki, discussion, design review
5. **Context-awareness**: syntax hi-lite, CAD view
6. **Access control**: roles, permissions
7. **Notification:** check-ins, comments, tickets, ...
8. **One-click project provisioning**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