
**Pacific Northwest
National Laboratory**

Operated by Battelle for the
U.S. Department of Energy

**Leap Frog
Digital Sensors and
Definition, Integration & Testing**

FY 2003 Annual Report

W.D. Meitzler
S.V. Shoemaker
R.L. Griswold

S.J. Ouderkirk
S. Tzemos

December 2003



Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RL01830

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Pacific Northwest National Laboratory
Richland, Washington 99352

Executive Summary

The objective of Leap Frog is to develop a comprehensive security tool that is transparent to the user community and more effective than current methods for preventing and detecting security compromises of critical physical and digital assets. Current security tools intrude on the people that interact with these critical assets by requiring them to perform additional functions or having additional visible sensors. Leap Frog takes security to the next level by being more effective and reducing the adverse impact on the people interacting with protected assets.

The Leap Frog project consists of several tasks shared by Pacific Northwest National Laboratory (PNNL), Bechtel's Remote Sensing Laboratory (RSL), and a third contractor yet to be announced. PNNL is responsible for two subtasks—the Leap Frog Definition, Integration and Test subtask and the Leap Frog Digital Sensors subtask. This document serves as a summary of project activity for FY03 and is the final FY03 deliverable for both subtasks.

The Leap Frog project was established in FY03. At the beginning of the project, a kickoff meeting was held with the Department of Energy Office of Security (DOE-SO) and RSL via video conferencing. The purpose of this meeting was to review the DOE-SO concept for the Leap Frog system. Following that conference, PNNL's Critical Infrastructure Protection Analysis Laboratory (CIPAL) was configured to support project development, and additional resources required for development are being identified and secured. Key PNNL staff with knowledge and training necessary for the successful and timely completion of the project are also being identified and secured, and one additional developer with a background in computer security was hired.

PNNL sensor and data fusion technologies were surveyed for possible use in the Leap Frog project. Two existing PNNL sensors were identified as being technologically promising and mature enough for use in the project. The Leap Frog team secured approval for the use of these sensors and began modifications to fit project requirements.

Members of the development team traveled to Nevada to meet with representatives from RSL. There they reviewed RSL technologies that may be important to the Leap Frog project, such as data fusion and sensors. They met with the head of RSL security and RSL personnel with expertise in physical and computer security and explored possibilities for combining the technologies and expertise of RSL and PNNL. While at RSL, the PNNL developers toured the RSL facilities and identified possible sites within RSL for Leap Frog alpha testing. This meeting brought together workers from RSL and PNNL and acted as a catalyst for future development.

During FY03, a potential Technical Support Working Group (TSWG) contractor was identified and a contract proposal was submitted. A draft Project Management Plan (PMP) was written with a preliminary schedule and overview of project tasks that takes this contract proposal into account. Draft functional and operational concepts documents were prepared based on input from PNNL, RSL, and commercial information related to the project. These documents will be used by the TSWG contractor to stimulate analysis and design. To allow for full dynamic participation of the TSWG contractor in the Leap Frog project, the functional and operational concepts documents will stay in draft form until after the final award of the TSWG contract.

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1.0 Introduction

The objective of Leap Frog is to develop a comprehensive security tool that is transparent to the user community and more effective than current methods for preventing and detecting security compromises of critical physical and digital assets. Current security tools intrude on the people that interact with these critical assets by requiring them to perform additional functions or having additional visible sensors. Leap Frog takes security to the next level by being more effective and reducing the adverse impact on the people interacting with protected assets.

The Leap Frog project consists of several tasks shared by PNNL, RSL, and a third contractor yet to be announced. PNNL is responsible for two subtasks—the Leap Frog Definition, Integration and Test subtask and the Leap Frog Digital Sensors subtask. The Leap Frog Definition, Integration and Test subtask involves the integration and testing of multiple sensors developed under separate life cycle plans and through TSWG. The Leap Frog Digital Sensors subtask is responsible for the development of cyber digital security sensors.

The purpose of this report is to summarize the FY03 Leap Frog project activity and to outline the activities to be implemented in the remaining phases of this multi-year project. This report serves as the final FY03 deliverables for both the Leap Frog Definition, Integration, and Testing Project and the Leap Frog Digital Sensors Project.

2.0 Technical Description

Leap Frog is a user-friendly, biometric based system that is transparent and highly effective in preventing and detecting compromises to the community that is being protected. The concept premise is that typical users perform no additional functions specifically for security. The system makes use of PNNL's extensive portfolio of cyber security sensor technologies and PNNL's extensive relationships in the security community for other emerging digital security sensor technologies. The system's sensors are situated in numerous locations inside and outside of facilities being protected and are networked into a central data processing facility. There are threat sensors (such as 3D video imaging, 3D holographic imaging, and RFID tagging of electronic media), environment sensors (such as heat and motion sensors), and asset protection sensors (such as fire alarms and smoke detectors). Examples of sensor locations are: 1) attached to individual work stations, 2) mounted at staff parking lot entry points, 3) situated at building entry points, and 4) situated at entry points into restricted access locations. Information gathered by the system's sensors is fused together and used by different parts of the organization.

The Figure 1 concept overview illustrates the objective of the Leap Frog project to migrate current security from obtrusive independent perimeter defenses to an integrated invisible asset-based monitoring and control system.

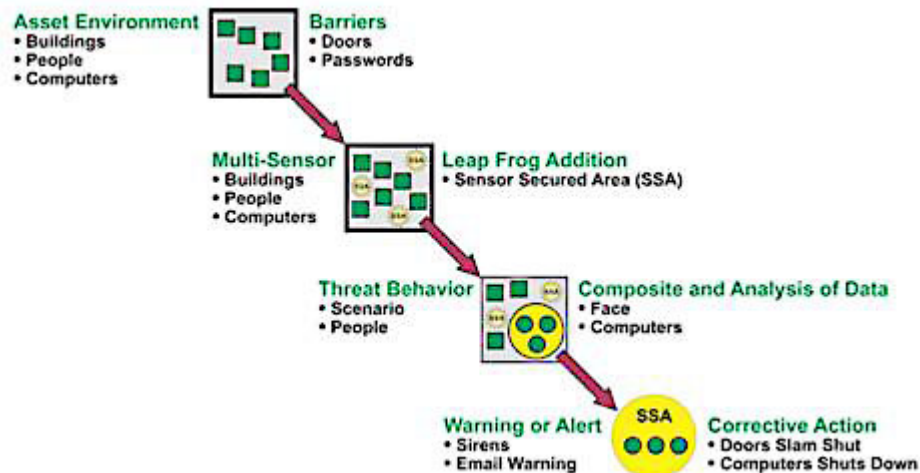


Figure 1. Concept Overview

3.0 Digital Sensors

The Digital Sensors task will select and enhance one or more existing digital security sensors under development at PNNL and develop an interface layer to support the integration of these sensors with the Leap Frog capability.

3.1 Technical Progress

In FY03, the project focused on laying the framework for the integration of multiple independent and interdependent digital sensors. This framework will include the creation of a sensor test bed, development of sensor test and evaluation criteria, and execution and assessment of those tests. Creation of the test bed will include acquisition of necessary hardware and software and integration of specialized digital instrumentation. Some of the digital instrumentation may need to be customized or developed to meet the objectives of this project.

The digital sensor development methodology leverages promising emerging sensor technology in the laboratory environment, upgrades it from its existing state (prototype, alpha) to a beta capability, and then integrates and applies it in the Leap Frog context for DOE use and evaluation. During FY03, we made significant progress in understanding the problems to be addressed and were able to lay plans for integrating the various subtasks of the project.

During FY03, we evaluated several security sensors that were developed or are currently under development at PNNL. Some sensor projects were dismissed because they were mainly physical security sensors as opposed to digital. Others were dismissed either as immature technologies or because of their security classification status.

Of these security sensor projects, three were evaluated at more depth. Those sensors were:

- Insider Threat Countermeasures Toolkit (ITCT)
- Flash-ROM Vulnerabilities Countermeasures Toolkit (FRVCT)
- Continuous Mouse Biometric Authentication (BioMouse)

The first two sensors projects were selected for use in the Leap Frog project due to their ability to fill the gaps in the security profile and for product maturity. The BioMouse project was thought to be very innovative but was not expected to achieve the reliability and maturity needed for deployment through Leap Frog.

The sensors selected will help identify and respond to insider threats by deploying host-based sensors that interact with a central analysis engine. The central analysis engine will detect and report actions that violate security policies and automatically deploy countermeasures to protect the assets.

The ITCT project is based on the integration of multiple interacting sensors deployed on the host systems that monitor user interactions with protected digital assets and report those interactions to a central

security monitor and analysis system. This capability is an active project currently in alpha development stage. The beta version of this capability is scheduled to be released by May 2004.

The FRVCT component-based security effort is directed at the monitoring and protection of firmware on personal computers running the Microsoft Windows operating system. This project is currently in beta development stage and is expected to be released by April 2004.

3.2 Organizational Progress

3.2.1 Task 1 - Project Management Plan

The project began with the identification of the principle investigator and the development team. A kick-off videoconference was held with DOE, RSL, and PNNL participating. The development team reviewed the PNNL leapfrog concept and initiated investigation of related security technologies. The TSWG contract proposal was reviewed to determine the implementation and architecture approach.

The draft Project Management Plan (PMP) has been written. This includes a preliminary schedule and overview of project tasks and has taken into account the current TSWG contract proposal and anticipated tentative award dates. The PMP was reviewed by the principal investigator and an internal review team that included the appropriate quality assurance (QA) representation. Subsequently, it was reviewed and approved by the program manager (PM) and product line manager.

A project portfolio, which is a set of documents describing the project at varying degree of detail and with judicious use of graphics, was created. This draft project portfolio set of documents has been routed for internal review and was approved by the PM. We will maintain these documents as part of the standard project document set and update them as required due to changes in project direction.

The development team will update the preliminary project plan and will revise it as needed to integrate with the final TSWG contract award. The preliminary version will be finalized as details of the TSWG contract are integrated and the specific tasks and roles for each participating organization are established. PNNL expects point-of-contact information from DOE for RSL and the TSWG contractors. PNNL also expects copies of Statements of Work, white papers, and any other related documents describing the proposed system from TSWG contractors.

Near the end of FY03, the project spend plan was changed to follow a revised budget with an anticipated carryover of approximately 13%. This allowed continuation of activities into FY04 and accommodated the delay in awarding the TSWG contract. In spite of the budget revisions, the activities planned for FY03 were completed, per the revised PMP. The PMP was revised to account for the delay in the TSWG contract award. The current PMP revision keeps the project documents in draft form until a final revision is made approximately 60 days following the award of the TSWG contract. The PMP has been revised to add anticipated FY04 activities and schedule revisions for the TSWG contract.

3.2.2 Task 2 - Summary Sensor Specifications:

This task prepares in summary form the requirements for the Leap Frog digital sensors then evaluates viable sensor technologies to fulfill the requirements. A sensor taxonomy was developed to be used in presenting PNNL sensor technology and for preparing summaries on candidate Leap Frog sensors. The taxonomy will also serve as a basis for the evaluation of viable sensor technologies to fulfill the system requirements. The outcome of this process will be the sensor specifications and a prioritized list of digital sensors designated as Sensor 1, Sensor 2, etc., that will be incorporated into a Summary Sensor Specifications document. The preliminary priority list will be finalized only after the award of the TSWG contractor comes on line.

After the TSWG contractor is selected, each sensor will be designated a project phase for development. The sensor specifications will be provided to the integration and testing organizations for incorporation into the comprehensive Leap Frog capability. The summary specifications are subject to change based on research, peer reviews, and test results. The deliverable for this task is to provide the Summary Digital Sensors Specifications to the Leap Frog integrator.

3.2.3 Task 3 - Peer Review:

We will begin identifying candidates to participate in the peer review that will be offered at the project midterm at PNNL. The review will be open to all personnel invited by the DOE project manager and PNNL.

3.2.4 Task 4 - Digital Sensor 1 Leap Frog Adaptation and Development:

(Delayed Task)

Data collection was initiated to determine specific capabilities and state of candidate sensors and to determine the level of modifications that may be required to bring the sensors into the leapfrog environment. A list of staffing needs, lab resources, and key resources to support initiation of development activities is also being developed.

3.2.5 Task 5 - Technical Consultation:

(Optional Task)

There was no activity on this optional task.

3.2.6 Task 6 - Demonstration & Annual Report:

The development team reviewed existing technology to determine its applicability to the Leapfrog project. This report serves as the Leap Frog Digital Sensor Annual Project Report.

3.3 FY04 Tasks

See Appendix B: Information Security Sensors Life Cycle Plan for details on milestones and task descriptions.

4.0 Definition, Integration and Testing

The Definition, Integration and Testing task will define the overall architecture of the Leap Frog system, integrate sensors and components from PNNL, RTL, and the TSWG contractor, and test the resulting system for compliance with project requirements.

4.1 Project Status

4.1.1 Task 1 - Project Management Plan:

The project started with the identification of the principal investigator and the development team. A kick-off video conference was held with DOE, RSL, and PNNL participating. The development team reviewed the PNNL Leap Frog concept and initiated investigation of related security technologies. The TSWG contract proposal was reviewed to determine the implementation and architecture approach.

The draft PMP has been written. This includes a preliminary schedule and overview of project tasks and has taken into account the current TSWG contract proposal and anticipated tentative award dates. The PMP was reviewed by the principal investigator and an internal review team that included the appropriate QA representation. Subsequently, it was reviewed and approved by the PM and product line manager.

A project portfolio, which is a set of documents describing the project at varying degree of detail and with judicious use of graphics, was created. This draft project portfolio was routed for internal review and approved by the PM. We will maintain these documents as part of the standard project document set and update them as required by changes in project direction.

The development team will update the preliminary project plan and will revise it as needed to integrate with the final TSWG contract award. The preliminary version will be finalized as details of the TSWG contract are integrated and the specific tasks and roles for each participating organization are established. PNNL expects point-of-contact information from DOE for RSL and the TSWG contractors. PNNL also expects copies of Statements of Work, white papers, and any other related documents describing the proposed system from TSWG contractors.

Near the end of FY03, the project spend plan was changed to follow a revised budget with an anticipated carryover of approximately 13%. This allowed continuation of activities into FY04 and accommodated the delay in awarding the TSWG contract. In spite of the budget revisions, the activities planned for FY03 were completed, per the revised PMP. The PMP was revised to account for the delay in the TSWG contract award. The current PMP revision keeps the project documents in draft form until a final revision is made approximately 60 days following the award of the TSWG contract. The PMP has been revised to add anticipated FY04 activities and schedule revisions for the TSWG contract.

4.1.2 Task 2 - Architecture Review:

Members of the development team met with representatives from RSL in Nevada to discuss relevant RSL architectures. The development team also reviewed existing PNNL, TSWG contractor, and commercial architectures. Information on system architectures is included in the preliminary draft summary of functional specifications and the TSWG contractor proposal.

4.1.3 Task 3 - Summary Functional Specification:

The development team prepared a preliminary draft summary of functional specifications that include a specification for each component. This will include review of RSL and TSWG contractor system concepts and requirements and scenarios. In the specification, each component will be prioritized and identified for development in Phase 1, Phase 2, or a future phase. The subsequent project integration and testing process will reference these specifications to determine test performance results. This will be a living document that is continually updated as the R&D progresses. This document will be finalized within 60 days from the award of the TSWG contract.

4.1.4 Task 4 - Peer Review:

We will begin identifying candidates to participate in the peer review which will be offered at the project midterm at PNNL. The review will be open to all personnel invited by the DOE Project manager and PNNL.

4.1.5 Task 5 - System Architecture:

(Delayed Task)

We will begin collection of related materials to support the Leap Frog system architecture which will convey the basic framework on which all Leap Frog capabilities are built and subsequently integrated. PNNL will solicit architecture input from all Leap Frog participants and then propose the basic architecture framework for the Leap Frog environment. The system architecture will be maintained in note form and made available to all Leap Frog developers.

4.1.6 Task 6 - Technical Consultation:

(Optional Task)

There was no activity on this optional task.

4.1.7 Task 7 - Demonstration & Annual Report:

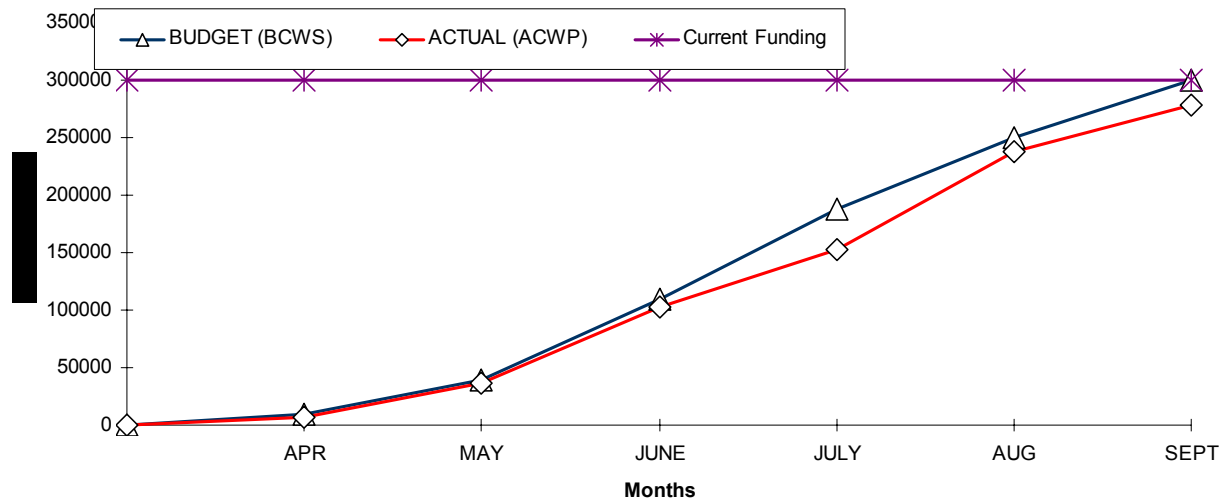
Existing technology was reviewed to determine its applicability to the Leapfrog project. This report serves as the Leap Frog Annual Research Report.

4.2 FY04 Tasks

See Appendix C: Definition, Integration & Testing for details on milestones and task descriptions.

Appendix A FY03 Schedule and Costs

Information Security Sensors (Classified Matter Protection) FY03 Costs

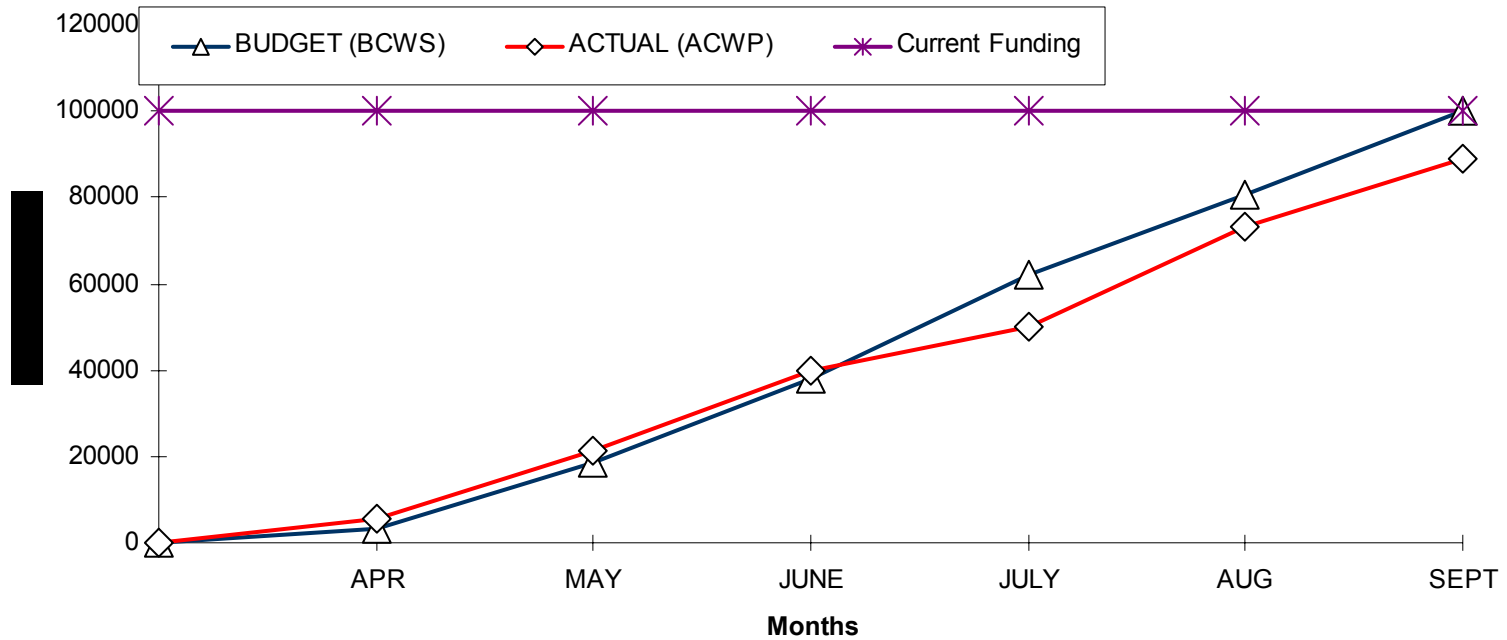


	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL
Budget (BCWS)	8,868	30,298	70,946	77,702	62,754	49,535	300,103
CUM Budget	8,868	39,166	110,112	187,814	250,568	300103	300,103
CUM COST VARIANCE \$	(7,284)	(36,679)	1,407	35,505	13,274	21,706	21,706
CUM COST VARIANCE %	0%	0%	1%	19%	5%	7%	7%

Information Security Sensors (Classified Matter Protection) FY03 Schedule

ID	Task Name	Duration	Start	2003											
				Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov			
15	PNNL Digital Sensors fy03	117 days	4/21/03												
16	integration meetings / travel	117 days	4/21/03												
17	management and secretarial support	117 days	4/21/03												
18	Project Management Plan Released	0 days	6/23/03												
19	Project Communication Portfolio Released	0 days	7/30/03												
20	develop summary sensor spec	66 days	5/26/03												
21	Summary Sensor Functional Specification Released	0 days	7/21/03												
22	CIPAL configuration and administration	117 days	4/21/03												
23	prototype sensor 1	87 days	6/2/03												
24	Peer Review Digital Sensors	0 days	8/25/03												
25	Sensor 1 Prototype Released	0 days	9/15/03												
26	annual report	12 days	9/15/03												
27	Annual Report Released	0 days	9/30/03												

Integration and Testing FY03 Costs



	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL
Budget (BCWS)	3,098	15,492	19,295	24,118	18,668	19,329	100,000
CUM Budget	3,098	18,590	37,885	62,003	80,671	100,000	100,000
CUM COST VARIANCE \$	(5,657)	(21,543)	(1,200)	12,179	7,672	10,900	10,900
CUM COST VARIANCE %	0%	0%	-3%	20%	10%	11%	11%

Integration and Testing FY03 Schedule

ID	Task Name	Duration	Start	Finish	2003											
					Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov			
2	PNNL Integration & Test fy03	117 days	4/21/03	9/30/03												
3	integration meetings / travel	117 days	4/21/03	9/30/03												
4	management and secretarial support	117 days	4/21/03	9/30/03												
5	Project Management Plan Released	0 days	6/23/03	6/23/03												
6	Project Communication Portfolio Released	0 days	7/30/03	7/30/03												
7	Summary Functional Specification	86 days	4/21/03	8/18/03												
8	Summary Functional Specification Released	0 days	8/18/03	8/18/03												
9	Concept of Operations Released	0 days	8/29/03	8/29/03												
10	system architecture	87 days	6/2/03	9/30/03												
11	Peer Review Integration and Test	0 days	8/25/03	8/25/03												
12	design notes released	0 days	9/15/03	9/15/03												
13	annual report	31 days	8/19/03	9/30/03												
14	Annual Report Released	0 days	9/30/03	9/30/03												

Appendix B Information Security Sensors Life Cycle Plan

PROJECT LIFECYCLE PLAN

Revision 11/17/2003

Origination

03/11/2003

Title: Leap Frog Information Security Sensors/Classified Matter Protection

Project PNNL - 1636

Lab: PACIFIC NORTHWEST NATIONAL LABORATORY

B/R Code 060401
SECURITY

B/R SCIENCE AND TECHNOLOGY BASE - PHYSICAL

DOE HQ Project

SO Project Manager

Richard Chan (301) 903-2655

SO Technical Monitor

Carl Pocratsky (301) 903-2769

SO Technical Monitor

Carl Piechowski (301) 903-4053

Lab/Contractor Project

Lab Project Manager

Wayne Meitzler (509) 375-3718

Lab Principal Investigator

Steve Ouderkirk (509) 375-4570

Project Funding (\$ in Thousands)

Fiscal	Operating Funds		Capital		Prior FY Carryover	Total FY Funds
	Requested	Allocated	Requested	Allocated		
	2003	300.0			300.0	0.0
	2004	300.0			300.0	
	2005	300.0				
	Totals	900.0			600.0	

Project

The objective of Leap Frog is to develop a comprehensive security tool that is transparent and more effective in preventing and detecting security compromises for the protection of critical digital assets. Current security methods intrude on the people that they protect, by requiring them to perform additional functions or having additional visible sensors. PNNL has developed an extensive portfolio of cyber security sensor technologies viable for Leap Frog consideration as well as extensive relationships in the security community for other emerging digital security sensor technologies. This project focuses on leveraging these technologies and prototypes, and developing them to the extent that they can become an integral part of the Leap Frog capability.

Capital Equipment

None

User Needs Alignment

AL-6 COMPUTER SYSTEM ACCESS CONTROLS

Potential Users:

Any DOE organization that needs to secure space or information.

Supported DOE Goals and Objectives

Goal Identifier	Title
-----------------	-------

NS-3	Technology Infrastructure & Core Competencies
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NS-3-D	Assist in other DOE national security asset objectives
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Technical and Operational Requirements

Metric #:	1
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Parameter:

Key parameters for security include authentication, behavior, and integrity checking.

Current Capability:

Current methods use passwords for static authentication and manual and electronic methods for integrity checking of digital systems.
--

Required Capability:

Necessary capabilities for digital systems include continuous authentication, behavior, and integrity checking without impacting performance.

Benefits:

The Leap Frog benefits provide greater security with less impact on staff productivity as relates to digital systems.

Related Work (funded by Non-OSS Organizations)

Fiscal	Funding	Amount
	NONE	0.0

Project Development Schedule (Start Dates)

Science and Unfunded User Need	Concept and Technology Base	Demonstration Development	Full Scale Development	Available to Users
2002 2003	2004	2005	2005	

Project

Fiscal 2003

Task:1

The following tasks provide the Leap Frog Digital Sensors lifecycle plan. The development methodology leverages promoting emerging sensor technology in the laboratory environment, upgrades it from its existing state (prototype, alpha) to a Beta capability, then integrates and applies it in the Leap Frog context for DOE use and evaluation.

Project Management Plan: The development team will prepare a project plan. The plan will serve as a project reference and is subject to change based on new guidance from the DOE project manager or changes from the research as it unfolds. The milestone for this task is the Project Management Plan that will be maintained at Pacific Northwest National Laboratory (PNNL).

Task:2

Summary Sensor Specifications: This task prepares in summary form the requirements for the Leap Frog digital sensors; then evaluates viable sensor technologies to fulfill the requirements. The outcome of this process will be the sensor specifications and a prioritized list of digital sensors designated as Sensor 1, Sensor 2, etc., that will be incorporated into a Summary Sensor Specifications document. Each sensor will be designated a project phase for development. The sensor specifications will be provided to the Integration & Testing organizations for incorporation into the comprehensive Leap Frog capability. The summary specifications are subject to change based on research, peer reviews, and test results. The deliverable for this task is to provide the Summary Digital Sensors Specifications to the Leap Frog integrator.

Task:3

Peer Review: A project peer review will be offered at the midterm of the project. The peer review will be open to all personnel invited by the DOE program manager and PNNL. The deliverable for this task is the peer review meeting notes.

Task:4

Digital Sensor 1 Leap Frog Adaptation and Development: Leveraging the Sensor 1 technology developed to date by other organizations, the research team will apply and enhance the sensor to meet Leap Frog requirements. The task will culminate with a Leap Frog proof-of-concept demonstration prototype. Demonstrations of the prototype will be made available to personnel designated by the DOE program manager. At the conclusion of this task, the prototype will be made available to the Leap Frog integrator for incorporation into the comprehensive Leap Frog prototype. The deliverable for this task is the Sensor 1 Proof-Of-Concept prototype.

Task:5

Technical Consultation (Optional): This task allows for providing technical consultation as relates to digital security sensor yet beyond what is currently authorized for Leap Frog. Each consultation request requires DOE project manager approval along with resources to cover the consultation expenses. The actual requests will specify milestones and deliverables at the time they are made.

Task:6

Demonstration & Annual Report: The project team will prepare a Leap Frog Digital Sensor Annual Project Report that will include as appendices the Summary Specifications, and the digital sensor test results. The deliverable for this task is the Leap Frog Digital Sensor Annual Research Report.

Fiscal 2004**Task:1**

Digital Sensor 1 Upgrade to Alpha Level: Feedback from the Sensor 1 prototype evaluation will be incorporated into the sensor and laboratory tests conducted to determine that the sensor performs at the Alpha level. Once complete, the research team will provide the Alpha grade sensor to the Leap Frog integrator for more broad scale evaluation in the context of the complete Leap Frog environment. The deliverable for this task is the availability to demonstrate the alpha sensor and to provide the sensor to the Leap Frog Integration team developer and PNNL review, updates to the specifications or components may be made.

Task:2

Digital Sensor 2 Proof-Of-Concept Prototype: Leveraging the Sensor 2 technology developed to date by other organizations, the research team will apply and enhance the sensor to meet Leap Frog requirements. The task will culminate with a Leap Frog proof-of-concept demonstration prototype. Demonstrations of the prototype will be made available to personnel designated by the DOE program manager. At the conclusion of this task, the prototype will be made available to the Leap Frog integrator for incorporation into the comprehensive Leap Frog prototype. The deliverable for this task is the Digital Sensor 2 Proof-Of-Concept Prototype.

Task:3

Digital Sensor 3 Proof-of-concept Prototype: Leveraging the sensor 3 technology developed to date by other organization investments, the research team will apply and enhance the sensor to meet Leap Frog requirements and translate the capability to the Leap Frog environment. The task will culminate with a Leap Frog proof-of-concept demonstration prototype. Demonstrations of the prototype will be made available to personnel designated by the DOE program manager. At the conclusion of this task, the prototype will be made available to the Leap Frog integrator for incorporation into the comprehensive Leap Frog prototype. The deliverable for this task is the Digital Sensor 3 Proof-Of-Concept Prototype.

Task:4

Digital Sensor 2 Upgrade to Alpha Level: Feedback from the Digital Sensor 2 Prototype evaluation will be incorporated into the sensor and laboratory tests conducted to determine that the sensor performs at the Alpha level. Once complete, the research team will provide the Alpha grade sensor to the Leap Frog Integration and Test team for more broad scale evaluation in the context of the complete Leap Frog environment. The deliverable for this task is the availability to demonstrate the alpha sensor and to provide the sensor to the Leap Frog Integration team developer and PNNL review, updates to the specifications or components may be made.

Task:5

Digital Sensor 3 Upgrade to Alpha Level: Feedback from the Digital Sensor 3 Prototype evaluation will be incorporated into the sensor and laboratory tests conducted to determine that the sensor performs at the Alpha level. One complete, the research team will provide the Alpha grade sensor to the Leap Frog Integration and Test team for more broad scale evaluation in the context of the complete Leap Frog environment. The deliverable for this task is the availability to demonstrate the alpha sensor and to provide the sensor to the Leap Frog Integration team.

Task:6

Technical Consultation (Optional): This task allows for providing technical consultation as relates to security yet beyond what is currently authorized for this Leap Frog Integration & Test. Each consultation request requires DOE project manager approval along with resources to cover the consultation expenses. The actual requests will specify milestones and deliverables at the time they are made.

Task:7

Demonstration & Annual Report: The project team will prepare an Annual Project Report that will include as appendices the Summary Requirements, Summary Specifications, the System Architecture Diagram, and R&D results. The deliverable for this task is the Leap Frog Annual Research Report. In addition, providers of technology shall demonstrate and provide copies.

Fiscal 2005**Task:1**

Digital Sensor 4 Proof-Of-Concept Prototype: Leveraging the sensor 4 technology developed to date by other organizations, the research team will enhance the sensor to meet Leap Frog requirements and translate the capability into the Leap Frog environment. The task will culminate with a Leap Frog proof-of-concept demonstration prototype. Demonstrations of the prototype will be made available to personnel designated by the DOE program manager. At the conclusion of this task, the prototype will be made available to the Leap Frog integrator for incorporation into the comprehensive Leap Frog prototype. The deliverable for this task is the Digital Sensor 4 Proof-Of-Concept Prototype.

Task:2

Beta Field Test: Digital sensors 1 through 3 who pass alpha tests, will be upgraded for Beta Field test. Feedback received through alpha tests will be incorporated into the sensors prior to submission for Beta Field Tests. Likewise, sensor specifications will be updated to the most recent information. The digital sensor team will support the Leap Frog Integration and Testing team during the field tests for matters specific to the digital sensors. The deliverable for this task is the submission of the Beta Field test sensors to the Leap Frog Integration and Testing team.

Task:3

Digital Sensor 4 Alpha Upgrade: Feedback from the Digital Sensor 4 Prototype evaluation will be incorporated into the sensor and laboratory tests conducted to determine that the sensor performs at the Alpha level. One complete, the research team will provide the Alpha grade sensor to the Leap Frog Integration and Test team for more broad scale evaluation in the context of the complete Leap Frog environment. The deliverable for this task is the availability to demonstrate the alpha sensor and to provide the sensor to the Leap Frog Integration team.

Task:4

The development team will offer a peer review to personnel selected by the DOE program manager of the outcomes from the Phase 1 Field Test and the Phase 2 Alpha Testing. Updates to the Summary Specifications will be made as necessary. The deliverable for this task are the Peer Review notes.

Task:5

Phase 2 Beta Field Test: All digital sensors tested to date at the alpha level plus sensor 4 will be updated base on previous test information, laboratory tested, and then submitted to the Leap Frog Integration team for Phase 2 Beta Field Test. The digital sensor test team will provide support for the field test as relates to the digital sensors. The team will also update specifications and sensors based on test outcomes.

Task:6

Technical Consultation (Optional): This task allows for providing technical consultation as relates to security yet beyond what is currently authorized for this Leap Frog Integration & Test. Each consultation request requires DOE project manager approval along with resources to cover the consultation expenses. The actual requests will specify milestones and deliverables at the time they are made.

Task:7

Demonstration & Annual Report: The project team will prepare the final project report that will include as appendices the Digital Sensor Summary Specifications, and R&D results. The deliverable for this task is the Leap Frog Digital Sensor Final Report.

Milestones and Deliverables**FISCAL 2003**

04/30/2003	Initiate R&D (Milestone)
05/30/2003	Peer Review Notes (FY05 Task 4 Deliverable)
05/30/2003	Alpha Digital Sensor 4 (FY05 Task 3 - Deliverable)
05/30/2003	Project Management Plan (FY03 Task 1 - Milestone)
05/30/2003	Summary Sensor Functional Specifications (FY03 Task 2 - Deliverable)
06/30/2003	Peer Review Notes (FY03 Task 3 - Deliverable)
08/30/2003	Digital Sensor Phase 2 Beta Field Test (FY05 Task 5 - Deliverable)
08/30/2003	Digital Sensor 1 Prototype (FY03 Task 4 Milestone)
09/30/2003	Project Final Report (FY05 Task 7 - Deliverable)
09/30/2003	Annual Project Progress Report (TY03 Task 6 - Deliverable)
09/30/2003	Alpha Digital Sensor 1 (FY04 Task 1 Deliverable)

FISCAL 2004

12/01/2003 Digital Sensor 2 Prototype (FY04 Task 2 - Deliverable)
03/01/2004 Digital Sensor 3 Prototype FY04 (Task 3 - Deliverable)
06/01/2004 Alpha Digital Sensor 2 (FY04 Task 4 - Deliverable)
08/30/2004 Alpha Digital Sensor 3 (FY04 Task 5 - Deliverable)
09/30/2004 Annual Project Progress Report (FY04 ask 7 - Deliverable)

FISCAL 2005

12/30/2004 Digital Sensor 4 Prototype (FY05 Task 1 Deliverable)
03/01/2005 Beta Field Test Sensor 1 through 3 (FY05 Task 2 - Milestone)

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Appendix C Integration & Testing Life Cycle Plan

PROJECT LIFECYCLE PLAN

Revision 11/17/2003

Origination 03/11/2003

Title: Leap Frog Definition, Integration & Testing

Project PNNL - 1637

Lab: PACIFIC NORTHWEST NATIONAL LABORATORY

B/R Code 060401
SECURITY

B/R SCIENCE AND TECHNOLOGY BASE - PHYSICAL

DOE HQ Project

SO Project Manager

Richard Chan (301) 903-2655

SO Technical Monitor

Carl Pocratsky (301) 903-2769

SO Technical Monitor

Carl Piechowski (301) 903-4053

Lab/Contractor Project

Lab Project Manager

Wayne Meitzler (509) 375-3718

Lab Principal Investigator

Steve Shoemaker (509) 375-6392

Project Funding (\$ in Thousands)

	Fiscal Requested	Operating Funds Allocated	Capital Requested	Capital Allocated	Carryover	Prior FY Funds	Total FY
2003	100.0	100.1	0.0				
2004	300.0	300.0					
2005	300.0						
Totals	700.0	400.1					

Project

The objective of Leap Frog is to develop a comprehensive security tool that is transparent to the user community and more effective than current methods for preventing and detecting security compromises of critical digital assets. Current security tools intrude on the people that they protect, by requiring them to perform additional functions or having additional visible sensors. Leap Frog takes security to the next level by being more effective and reducing the adverse impact on the people it protects. This project involves the integration and testing of multiple sensors developed under separate life cycle plans and through TSWG.

Capital Equipment

None

User Needs Alignment

AL-6 COMPUTER SYSTEM ACCESS CONTROLS

Potential Users:

Any DOE organization that needs to secure space or information.

Supported DOE Goals and Objectives

Goal Identifier

Title

NS-3Technology Infrastructure & Core Competencies

NS-3-D Assist in other DOE national security asset objectives

Technical and Operational Requirements

Metric #: 1

Parameter:

Key parameters for security include authentication, behavior, and integrity checking.

Current Capability:

Current methods use manual processes or passwords for static authentication and manual and electronic methods for integrity checking.

Required Capability:

Necessary capabilities include continuous authentication, behavior, and integrity checking without impacting performance.

Benefits:

The Leap Frog benefits provide greater security with less impact on staff productivity.

Related Work (funded by Non-OSS Organizations)

Fiscal	Funding	Amount
	NONE	0.0

Project Development Schedule (Start Dates)

Science and Unfunded User Need	Concept and Technology Base	Demonstration Development	Full Scale Development	Available to Users
2002	2003	2004	2005	2005

Project**Fiscal 2003****Task:1****FY 2003 STATEMENT OF WORK:**

The following tasks provide the Leap Frog Integration and Test functions for this lifecycle plan. In FY2003, the project initiates laying the framework for the integration of multiple independent and interdependent sensors. This framework will include the creation of a sensor test bed, development of sensor test and evaluation criteria, and execution and assessment of those tests. Creation of the test bed through FY 2003 and 2004 will include acquisition of necessary hardware and software and integration of specialized digital instrumentation. Some of the digital instrumentation may need to be customized or developed to meet the objectives of this project.

Project Management Plan: The development team will prepare a project plan. The plan will serve as a project reference and is subject to change based on new guidance from the DOE program manager or changes necessary based on research results as they unfold. The milestone for this task is the Project Management Plan that will be maintained on file at Pacific Northwest National Laboratory (PNNL).

Task:2

Architecture Review: Review multi-sensor fusion architectures being pursued by various organizations, and provide recommendations on the merit of each.

Task:3

Summary Functional Specification: The development team will prepare a summary functional specification that will include a specification for each component. The document incorporates specification input directly received from all developers including the Leap Frog contractor/s, the Remote Sensing Laboratory (RSL), and PNNL. In the specification, each component will be prioritized and identified for development in phase 1, phase 2, or a future phase. The subsequent project integration and testing process will reference these specifications to determine test performance results. This will be a living document that is continually updated as the R&D progresses. The deliverable for this task is the Leap Frog Summary Functional Specifications.

Task:4

Peer Review: A project peer review will be offered at the project midterm at PNNL. The review will be open to all personnel invited by the DOE project manager and PNNL. The deliverable for this task is the peer review meeting notes.

Task:5

System Architecture: The Leap Frog system architecture will convey the basic framework on which all Leap Frog capabilities are built and subsequently integrated. PNNL will solicit architecture input from all Leap Frog participants, then recommend an architecture framework for the Leap Frog environment. The system architecture will be maintained in note form and made available to all Leap Frog developers. The milestone for this task is the Leap Frog Design Notes that will have sufficient detail such that each developer may proceed to build their components.

Task:6

Technical Consultation (Optional): This task allows for providing technical consultation as relates to security yet beyond what is currently authorized for this Leap Frog Integration & Test. Each consultation request requires DOE project manager approval along with resources to cover the consultation expenses.

Task:7

Demonstration & Annual Report: The project team will prepare an Annual Project Report that incorporates as appendices the Summary Functional Specifications, the System Architecture Diagram, and R&D results. The deliverable for this task is the Leap Frog Annual Research Report. Prototype demonstrations will be made available upon request at the Critical Infrastructure Protection Analysis Laboratory (CIPAL) located at Pacific Northwest National Laboratory (PNNL).

Fiscal 2004**Task:1**

Phase 1 Prototype Integration: Capabilities authorized by the DOE program manager will be provided to the PNNL research team for integration into the Leap Frog Proof-Of-Concept prototype. Each capability with accompanying documentation will have been laboratory tested by the developer prior to submission for integration. The milestone for this task is the availability of a demonstration of the Leap Frog Phase 1 Prototype at PNNL's Critical Infrastructure Protection & Analysis Laboratory (CIPAL).

Task:2

Phase 1 -Prototype Testing: The Phase 1 Prototype will be tested and measured against the specifications for each component. The tests will be performed based on a high level test plan prepared under this task. Performance information for each component obtained during the testing process will be supplied to the component developer. Based on the collective developer and PNNL review, updates to the specifications, requirements, or components may be made. The deliverable for this task is the Phase 1 Test Report.

Task:3

Peer Review: A peer review of project progress will be offered at the project midterm at PNNL. The peer review will be open to all personnel invited by the DOE program manager and PNNL. The deliverable for this task is the peer review meeting notes and any recommended changes for the Leap Frog specifications.

Task:4

Phase 1 Alpha Integration: The Phase 1 Alpha capability will be developed using updated components supplied by the developers, tested and measured against the specifications for each component. Component performance information will be supplied to each developer. Based on the collective developer and PNNL review, updates to the specifications or components will be made.

Task:5

Phase 1 Alpha Testing: The Phase 1 Alpha capability will be tested and measured against the specifications for each component. Performance information for each component will be supplied to each developer. Based on the collective developer and PNNL review, updates to the specifications or components may be made. Then the Alpha capability will be ready for field testing.

Task:6

Technical Consultation (Optional): This task allows for the provision of technical consultation as relates to security yet beyond what is currently authorized for this Leap Frog Integration & Test. Each consultation request requires the DOE project manager approval along with resources to cover the consultation expenses. Requests will specify the deliverables to accompany them at the time they are made.

Task:7

Demonstration & Annual Report: The project team will prepare an Annual Project Report that will include as appendices the Summary Functional Specifications, the System Architecture Diagram, and R&D results. The deliverable for this task is the Leap Frog Annual Research Report. In addition, providers of technology shall demonstrate and provide copies.

Fiscal 2005**Task:1**

Phase 1 Beta Field Test: The Phase 1 Beta capability will be tested in a selected DOE facility and feedback will be provided by the users. The user feedback of performance information will be collated and analyzed. Then performance information and analysis results for each component will be supplied to each developer. Based on the collective developer and PNNL review, updates to the specifications or components may be made.

Task:2

Phase 2 Alpha Integration: The Phase 1 Alpha components already tested and new phase 2 components provided by the various sources will be integrated into a single systems. Preliminary testing will be done to confirm that the integration was successful and to demonstrate the integrated capabilities to those designated by the DOE program manager. The milestone for this task is the integrated system located at PNNL and the provision of the integrated system to the testing team.

Task:3

Peer Review: The development team will offer a peer review to personnel selected by the DOE program manager of the outcomes from the Phase 1 Field Test and the Phase 2 Alpha Testing. Updates to the Summary Specifications will be made as necessary. The deliverable for this task are the Peer Review notes.

Task:4

Phase 2 Alpha Testing: The Phase 2 Alpha capability will be tested and measured against the specifications for each component. Performance information for each component will be supplied to each developer. Based on the collective developer and PNNL review, updates to the specifications or components may be made. The capability will be modified based on recommendations and made ready for field testing.

Task:5

Phase 2 Beta Field Test: The Phase 2 Beta capability will be tested in a selected DOE facility and feedback will be provided by the users. Performance information for each component will be supplied to each developer. Based on the collective developer and PNNL review, updates to the specifications, requirements, or components may be made. The deliverable for this task is the Phase 2 Beta Field Test report.

Task:6

Technical Consultation (Optional): This task allows for the provision of technical consultation as relates to security yet beyond what is currently authorized for this Leap Frog Integration & Test project. Each consultation request requires the DOE project manager approval along with resources to cover the consultation expenses. Requests will specify the deliverables to accompany them at the time they are made.

Task:7

Demonstration & Annual Report: The project team will prepare an Annual Project Report that will include as appendices the Summary Functional Specifications, the System Architecture Diagram, and R&D results. The deliverable for this task is the Leap Frog Annual Research Report. In addition, providers of technology shall demonstrate and provide copies.

Milestones and Deliverables**FISCAL 2003**

04/30/2003	Initiate R&D (Milestone)
05/30/2003	Project Management Plan (FY03 Task 1 - Milestone)
05/30/2003	Report on Architecture Review (FY03 Task 2 Deliverable)
06/30/2003	Summary Functional Specifications (FY03 Task 3 - Deliverable)
07/30/2003	Peer Review Meeting Notes (FY03 Task 4 - Deliverable)
08/30/2003	Leap Frog Design Notes (FY03 Task 5 - Milestone)
09/30/2003	Annual Project Report (FY03 Task 7 - Deliverable)

FISCAL 2004

11/30/2003	Leap Frog Phase 1 Prototype (FY04 Task 1 - Milestone)
02/01/2004	Phase 1 Prototype Test Report (FY04 Task 2 - Deliverable)
03/01/2004	Peer Review Notes (FY04 Task 3 - Deliverable)
05/01/2004	Leap Frog Alpha Capability (FY04 Task 5 - Milestone)
07/30/2004	Alpha Test Report (FY04 Task 5 Deliverable)
09/30/2004	Annual Project Report (FY04 Task 7 - Deliverable)

FISCAL 2005

11/30/2004	Phase 1 Beta Test Report (FY05 Task 1 - Deliverable)
02/01/2005	Phase 2 Alpha (FY05 Task 2 - Milestone)
06/01/2005	Peer Review Notes (FY05 Task 3 Deliverable)
06/30/2005	Phase 2 Alpha Test Report (FY05 Task 4 - Deliverable)
08/30/2005	Phase 2 Beta Field Test Report (FY05 Task 5 Deliverable)
09/30/2005	Project Final Progress Report (FY05 Task 7 - Deliverable)

Required

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Carl A. Pocratsky
SO-13/Germantown Building
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, DC 20585-1290

Darryl B. Toms
SO-11/Germantown Building
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, DC 20585-1290

Larry D. Wilcher
SO-10/Germantown Building
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, DC 20585-1290

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