Purdue University
Center for Education and Research in Information Assurance and Security
PRISM Lab: Production, Robotics, Integration Software for Manufacturing/Management

ASSURING INFORMATION IN NETWORKED ENTERPRISES THROUGH ACTIVE PROTOCOLS and AUTONOMOUS AGENTS

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One-Year Project Overview

1. **Organization's effectiveness** depends on "good" information; workers are overcome by complexity, overload
2. **Information security** is no longer just a "protection" issue, especially in distributed systems, e.g., ERP, CRM, etc.
3. **Assurance requirements** include value of decisions, and trustworthiness; TQM context

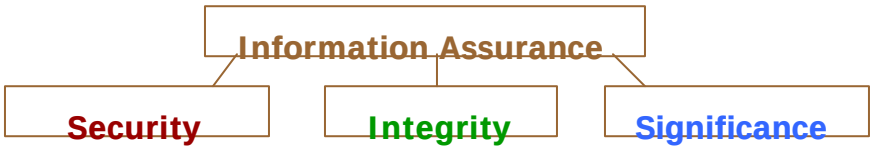
4. **Objectives:**

   a) Understand assurance needs – lit.; industry; lab
   b) Design/combine protocols, agents to help automate and adjust level of information assurance
   c) Theory development *and* experiments

Defining Information Assurance

- **"Traditional" definition**: Measure how security features mediate and enforce the security policy
- **Industry concerns**:
  - Quality and delivery assurance with cost effectiveness
  - Total information (decisions?) quality management (**TIQM**)

Our Definition…

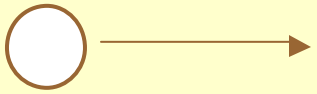


Security	Integrity	Significance
Protection from external & internal threats	Permanency during communication & storage	Value the intended user can derive
Users' profiles Data profiles	Recovery	*Value:* intrinsic; contextual; representational

Models of Active Protocols & Agents

- **Tasks**: **P**roduction; **A**ssurance; **C**oordination
- Whose **role** is it? Needs-based design

Ex. Agents with both production & assurance tasks



Validity of data not checked

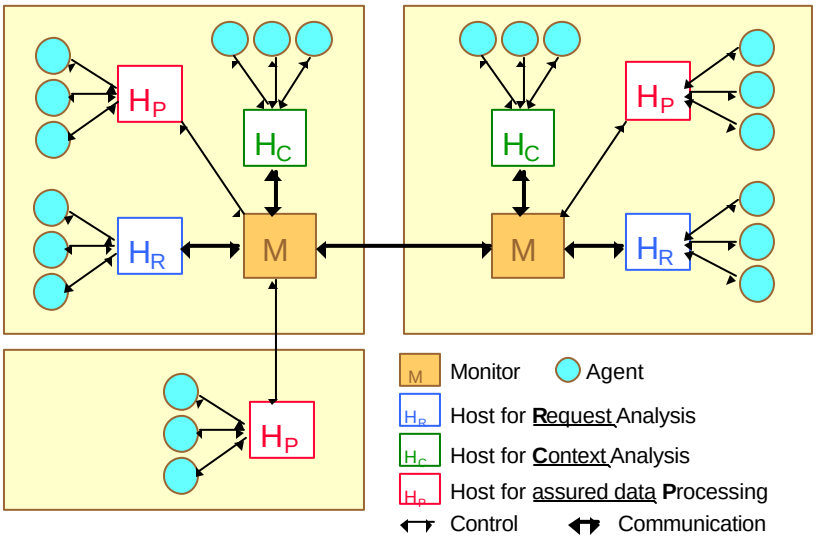
Data validated before it is processed

- Models: Separated $\rightarrow \{P_a + A_a\} ; \{P_c + A_c\}$
  Combined $\rightarrow \{PA_a\} ; \{PA_c\}$
  Mixed $\rightarrow \{P_a+PA_a+A_a\};\{P_c+A_c+PA_c\}$

Models (cont.)

- **Coordination techniques**:
  - Organizational structure
  - Meta-level information exchange
  - Multi-agent planning and decision support
- **Agent design considerations**:
  - Processing time, risk assessment
  - Flexibility/Mobility
  - Robustness against subversion
  - Scalability of the system

Autonomous agents for assured data processing

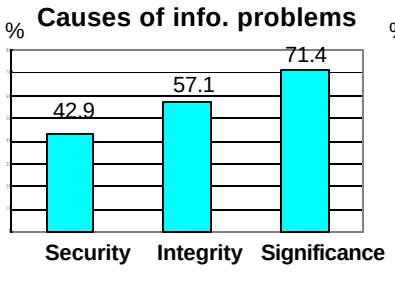


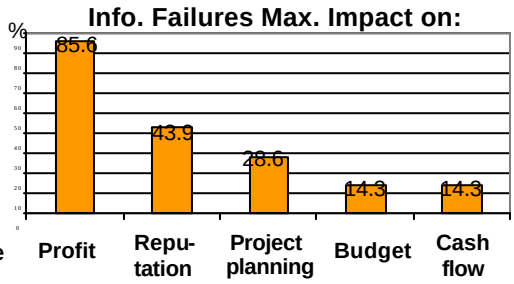
Survey of Requirements

- Assess the impact of *wrong* and *delayed* information on the performance of a networked enterprise
- Relate requirements to design

1) **Lab experiments**: ERP simulator (MICSS/MERP)
2) **Industry survey**: 15 US, EU, Asia Co. responses

* Responses to our survey [see end of this presentation] are accepted till 12/31/2001 at snof@purdue.edu

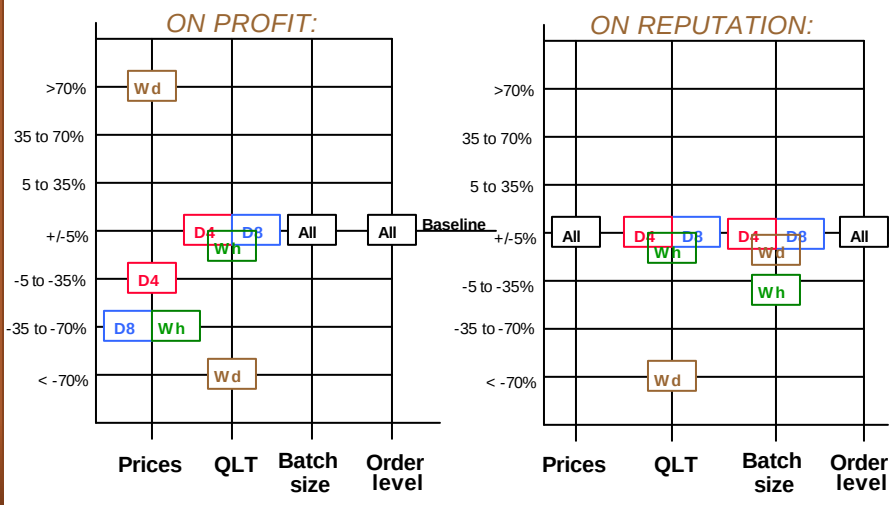




Lab experiments

6 periods x 10 years / 16 scenarios

MAXIMUM BI-MONTHLY IMPACT :



Summary and Future Research

- Assurance requirements dictate the design
- Design and evaluate the alternative models
  - by analytic models (TIE simulators)
  - by risk analysis model
- Delivery: Initial design recommendations and survey results
- Future:
  - Focus on industry case studies [needed !!]
  - Dependency analysis; Critical Factor evaluation
  - Task optimization

Research Memos

- Bellocci, T. Ang, C.B. Ray, P. and Nof, S.Y., **Information assurance in networked enterprises: Definition, requirements, and lab experiments**, Research Memo, January 2001
- Ang, C.B. and Nof, S.Y., **Design issues for information assurance with agents: Coordination protocols and role combination in agents**, Research Memo, February 2001
- Ray, P. Bellocci, T. and Nof, S.Y., **MICSS experiments and industry survey of information assurance**, Research Memo, May 2001
- Bellocci, T. and Nof, S.Y., **Models for information assurance: Design and evaluation**, Research Memo, August 2001

* The **Survey-I** for CIO/Info Director, and **Survey-U** for COO/Manager(s) of Depts. using the information are attached next