



Visual Analytics for Requirements-driven Risk Assessment

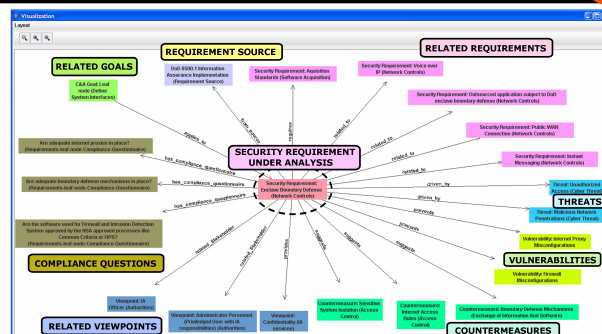
Robin A. Gandhi, Seok-Won Lee

Knowledge-Intensive Software Engineering (NiSE) Research Group, College of Computing and Informatics, UNC Charlotte, NC, USA

1 The Position

- **Requirements Visualization** plays an important role in dealing with the complexities from
 - Numerous Dependability Requirements
 - Software-intensive Systems
 - Socio-technical Environments
- **Visual Analytics for Requirements** is the creation of abstract *visual metaphors* based on quantitative and qualitative requirements metrics that help to systematically reason about the related software behavior in a large information space

Multi-dimensional Requirements Visualization

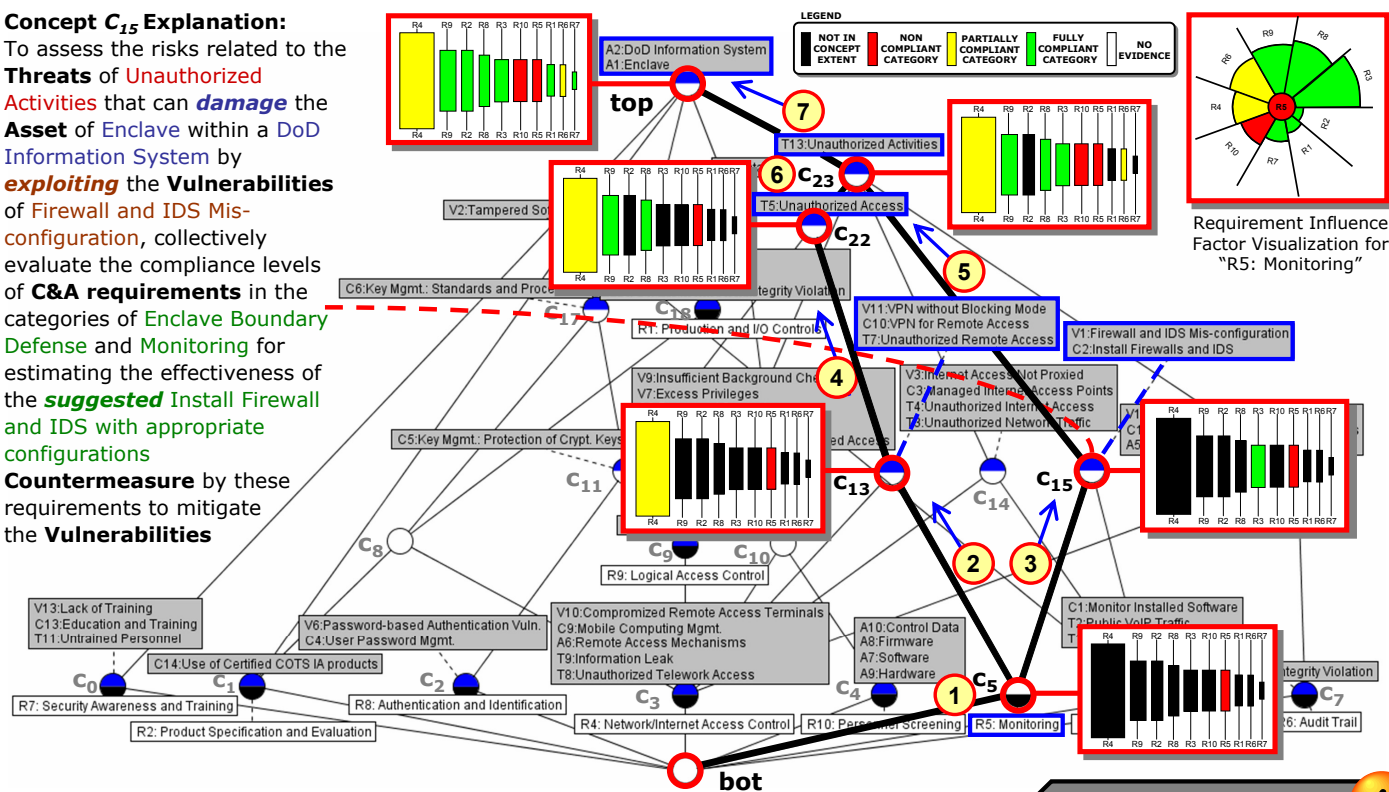


3 Visualizing Non-compliance Impact Analysis for Risk Assessment

- **Step 1 (Localization):** Locate the most specific formal concept that characterizes the non-compliant requirement categories (**Concept C₅** for "**R5: Monitoring**" labeled as 1)
- **Step 2 (Traversal):** The impact of non-compliance is gradually propagated at higher levels of abstraction in the concept lattice. (Paths labeled as 2, 3, 4, 5, 6, & 7)

Concept C₁₅ Explanation:

To assess the risks related to the **Threats** of **Unauthorized Activities** that can **damage** the **Asset** of **Enclave** within a **DoD Information System** by **exploiting** the **Vulnerabilities** of **Firewall and IDS Mis-configuration**, collectively evaluate the compliance levels of **C&A requirements** in the categories of **Enclave Boundary Defense** and **Monitoring** for estimating the effectiveness of the **suggested Install Firewall and IDS with appropriate configurations** **Countermeasure** by these requirements to mitigate the **Vulnerabilities**

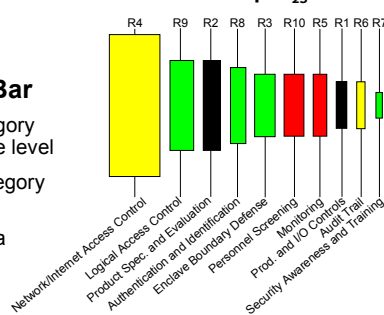


Visual Metaphors

► Cohesive Bar Graph

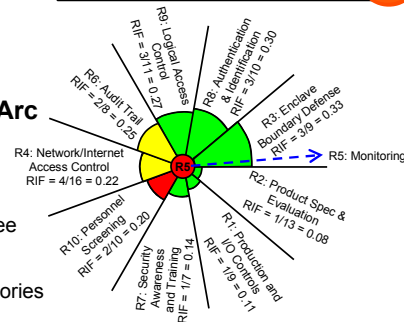
- **Visualization Context:** Formal Concept
- **Visual Features of a Bar**
 - **Color:** Requirement category presence and compliance level
 - **Height:** Requirement category correlation Index
 - **Width:** Risk coverage of a requirement category
 - **Order:** Relative criticality

Concept C₂₃



► Cohesive Arc Graph

- **Visualization Context:** Requirement Category
- **Visual Features of an Arc**
 - **Color:** Requirement category compliance level
 - **Arc Radius:** Requirement influence factor is the degree of similarity between two requirement categories in correlating with other categories in the given scenario



"R5: Monitoring" Requirement Category

5 References

- Gandhi, R.A., Lee, S.W.: Discovering and Understanding Multi-dimensional Correlations among Certification Requirements with application to Risk Assessment, India, RE 07

- Lee, S.W., Gandhi, R.A.: Requirements as Enablers for Software Assurance, CrossTalk: The Journal of Defense Software Engineering, December Issue, 19(12), 2006, pp. 20-24.