An Overview of the RISCOSS Decision Support Platform Methodology and Architecture

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Content

An Overview of the RISCOSS Decision Support Platform, Methodology and Architecture

Abstract

This white paper introduces the RISCOSS Decision Support Platform. RISCOSS develops a risk management-based methodology to facilitate the adoption of open source code into mainstream products and services. RISCOSS develops a methodology and a software platform that integrate the whole decision-making chain, from technology criteria to strategic concerns. Using advanced software engineering techniques and risk management methodologies, RISCOSS develops innovative tools and methods to identify, manage and mitigate risks of integrating third-party open source software. RISCOSS not only enables users to collect informed intelligence on open source components, but goes one step further by offering risk analyses that adapts to individual business situations. RISCOSS is the only platform to deliver a complete solution rather than a piecemeal approach to enable mainstream product developers to safely integrate open source software in their developments. Itself an open source project, RISCOSS is open to third-party contributions to help the platform grow in functionalities and make the transition to a fully marketable product or service.

Background

This white paper is based on a presentation given by Xavier Franch, Universitat Politècnica de Catalunya, at OW2con'13 on 24 Nov 2013 available at: http://www.riscoss.eu

Disclaimer

The purpose of this white paper is to provide an introduction to the RISCOSS Decision Support Platform with specific focus on the positioning of new concepts. The paper does not provide an exhaustive discussion of the RISCOSS Decision Support Platform and is not a competitive analysis of alternative decision support options. The information published herein is subject to change without notice. All company names, products and services mentioned herein are trademarks or registered trademarks of their respective owners.

An Overview of the RISCOSS Decision Support Platform, Methodology and Architecture

Introduction

The RISCOSS project was launched to address issues raised by communication equipment manufacturers looking to integrate open source code into their products. While open source software is now recognized as an indisputable industry asset, many mainstream companies and managers are still uncomfortable about making the strategic move to the open source way of working. For a while, influential industry analysis firm Gartner Group, has contended that while open source is about freedom and choice, freedom and choice introduce risk[1] and reports insufficient risk management as one of the five topmost mistakes to avoid when implementing OSS-based solutions[2]. RISCOSS not only enables users to collect informed intelligence on open source components, but also goes one step further by offering risk analysis that adapts to individual business situations

This white paper introduces RISCOSS Decision Support Platform that uses advanced software engineering techniques and risk management methodologies to help managers and decision makers unfamiliar with the underlying mechanisms of the open source world, make informed decisions regarding integrating open source components into their own projects, products or services.

RISCOSS is a collaborative project with funding support by the European Commission. It develops both a methodology and a software platform that integrate the whole decision-making chain, from technology criteria to strategic concerns to help managers identify, manage and mitigate risks of integrating third-party open source software.

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1   Gartner Group. "Critical Strategies to Manage Risk and Maximize Business Value of Open Source in the Enterprise". June 2011.
2   Gartner Group. "Five Mistakes to avoid when Implementing Open-Source Software". November 2011.

The foundation of the methodology

A reference scenario Let's take the example of a commercial company manufacturing communication equipment. These products call on a lot of software! Manufacturing companies are in a complex ecosystem, their product lines manage many different products composed of thousands of software components including commercial and open source components and components developed in-house.

They need to maintain several versions of each product at the same time for each of the variants, for instance, two versions in maintenance and another in development. There may be different versions or variants of the same product when products are customised to meet the requirements of specific markets. While a given component is generally used through the different releases of the different products, it may not incorporate all the patches currently available within the community perhaps because of the inter-dependencies between components that need to be properly handled.

Such is the situation that managers need support in order to manage all the risks that appear during the lifetime of the projects regarding whether to adopt or not a particular component, whether to open source it or not and whether to upgrade or not at a particular moment or wait for the next release, etc. In this perspective, we recognize that understanding, managing and mitigating OSS adoption risks is crucial to avoid potentially significant adverse impacts on the business, in terms of time to market, customer satisfaction, revenue and brand image.

The i* framework[3] is a goal-oriented and agent-oriented modeling framework. i* is currently one of the best organizational modeling techniques. Its main feature is its ability to represent intentional social relations among stakeholders. It provides the required infrastructure to model concepts such as actors, roles and agents, and to develop reasoning mechanisms with them. The i* framework defines two key models at different level of abstraction: the Strategic Dependency model and the Strategic Rationale model. A set of modeling primitives defines the model components and the relationships among them, where each business element is labeled according to its description.

Modeling the business and software ecosystems While considering open source adoption in terms of risk management, it becomes clear that code itself is just the tip of the iceberg. Open source software is defined by the stakeholders that support it: contributors, communities, users, open source organizations, etc. The RISCOSS risk-based perspective highlights the role of the business and software ecosystems. It takes into account both the point of view of the communities providing the software components and that of the companies looking to integrate them.

And here is one of the key innovation provided by the RISCOSS solution: it leverages advanced academic research to create a model of the business and software ecosystems relating to a target open source component. RISCOSS is based on a foundational ontology that links key concepts in business and (open source) software ecosystems.

As a result, RISCOSS specifies the risks a company may face in adopting open source components, how to manage these and how to define mitigation actions for these risks.

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3 E.S.K. Yu. Modeling Strategic Relationships for Process Re-Engineering. PhD Thesis, Department of Computer Science, University of Toronto. 1995.
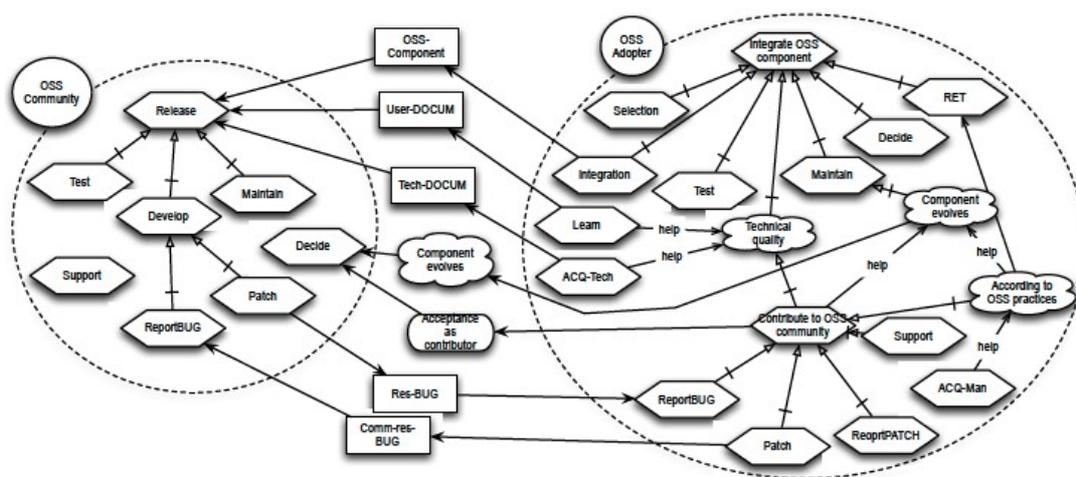
Fig. 1: Example of i*model representation of an ecosystem

Figure 1 illustrates the type of models that RISCOSS builds in order to represent roles and relations in an open source ecosystem. It maps the actors who may have a stake in the risk management process, the objectives they may have, the tasks they need to execute in order to fulfill their objectives and their dependencies both in the sense of collaboration and in the sense of vulnerability.

From project and community raw data to business goals RISCOSS links this model with what can be called a risk management analytic process. The objective is to establish causal links between raw data and facts that represent community dynamics at one end of the process, and potential impact on business results at the other. The RISCOSS analytic process is based on a three-layered approach to risk management in FLOSS projects.

The first layer concerns aggregating raw data collected from communities and projects into what RISCOSS calls risk drivers. Raw data are easily collected from tools such as bug trackers, repositories and mailing lists and from third-party tools such as FOSSology, Sonar, Antepedia, etc. Risk drivers represent summarized data over a specific time frame. For example, a series of bug report data (raw data) is aggregated into a distribution of the number of bugs over a given period of time (risk driver).

In the second layer, statistical analysis, Bayesian networks and social network analysis are used to derive risk indicators from the risk drivers. Reliability and maintainability of the code are examples of risk indicators. Together with community and contextual indicators, they contribute to the definition of a risk model which is validated by experts from a qualitative perspective through what RISCOSS calls tactical workshops.

The same approach is used in the third layer to derive any potential impact on business risk/goals, mapped from risk indicators through a second type of qualitative validation called the strategic workshop. By linking the resulting distribution of business risk/goals with the different i*models of the business and software ecosystems, RISCOSS enables adequate business-driven risk management of adopting open source software.

Figure 2 illustrates how the RISCOSS process leverages the Bayesian network approach with a highlight, on the community timeliness risk indicator. At the highest level, the system helps assess the strategy risks, operational risks, financial risks and social hazard risks of integrating an open source software component.
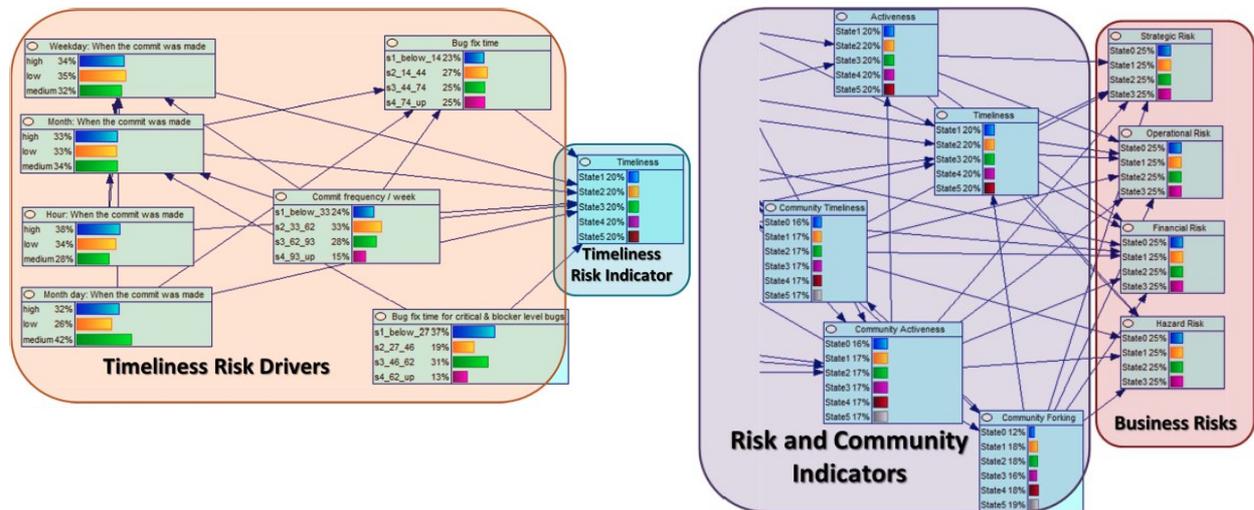

Fig 2: Example of a Bayesian network data-to-risk linkage

To summarize how everything fits together, it is a bottom-up approach: raw data is collected from project and community tools including development and code analysis tools. These are derived into business risks and goals in relation with the business and software ecosystem model which is configured based on evidence collected from experts. From these, the impact of the risks is related to the ecosystem which is represented by several actors, their goals, the tasks they execute and the resources they consume.

The decision support platform

This section introduces the architecture of the RISCOSS platform. The platform is the embodiment of the methodology into a open source software. Software implementation of the methodology is designed to support the whole process, from the collection of open source projects raw data to the provision of decision guidelines for a given adopter. The platform is a web application available for download and that can be deployed in-house or accessed as an online decision support service.
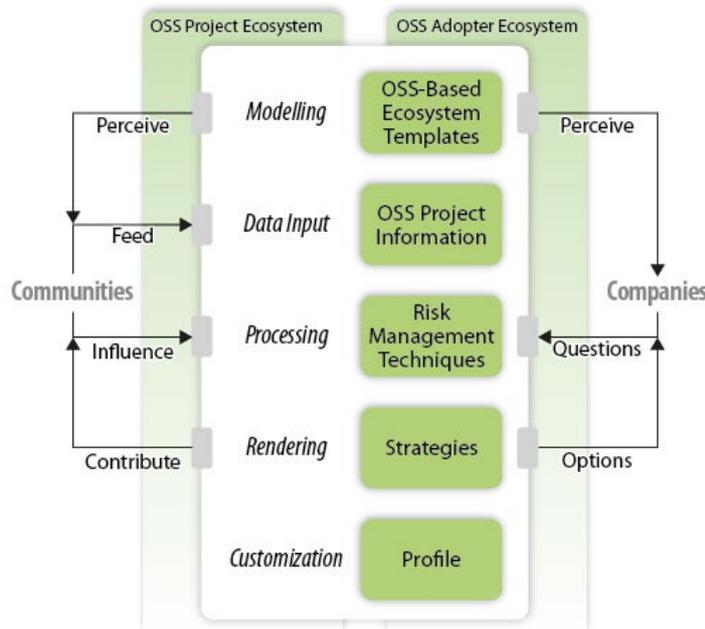
Fig. 3 Overview of the RISCOSS platform

Platform scope The RISCOSS platform is intended to be operated within an ecosystem of resources and stakeholders. Figure XX provides an overview of the platform. RISCOSS takes into consideration the perspective of the project ecosystem, including communities of developers and contributors and that of the adopter, most likely to be a company looking to integrate an OSS component into a product or service.

The major functions include modeling of the ecosystems and the risk profile of the adopter organization, collecting relevant data from the projects, processing models and data by applying innovative statistical and risk processing techniques and then delivering results to users in a useful manner and providing support for selecting between options.

The platform is highly flexible and can be customized depending on user profiles, preferences and business conditions.

It draws data from tools used by open source communities of developers and contributors, leverages data analysis tools and takes into account the behavior of community members and users. Tools used by communities to manage their projects are, with some exceptions, publicly accessible. Users of the RISCOSS platform are development teams within companies. The system they use to manage their projects and activities can be considered functionally equivalent to those found in open source communities, with the difference that they are not accessible from outside the company. The RISCOSS Platform provides the interfaces to interact with these systems and to provide outputs to users looking to run risk analysis in a context of open source component adoption.

Platform Structure The RISCOSS Decision Support platform comprises an extensible application that runs on the XWiki platform. The RISCOSS application is designed to be extensible. In its current version, it is comprised of a number of functional components. There are two main families of components: those that are used across the whole platform and those that are used within a domain. Figure 4 presents the overall architecture and all its major components.
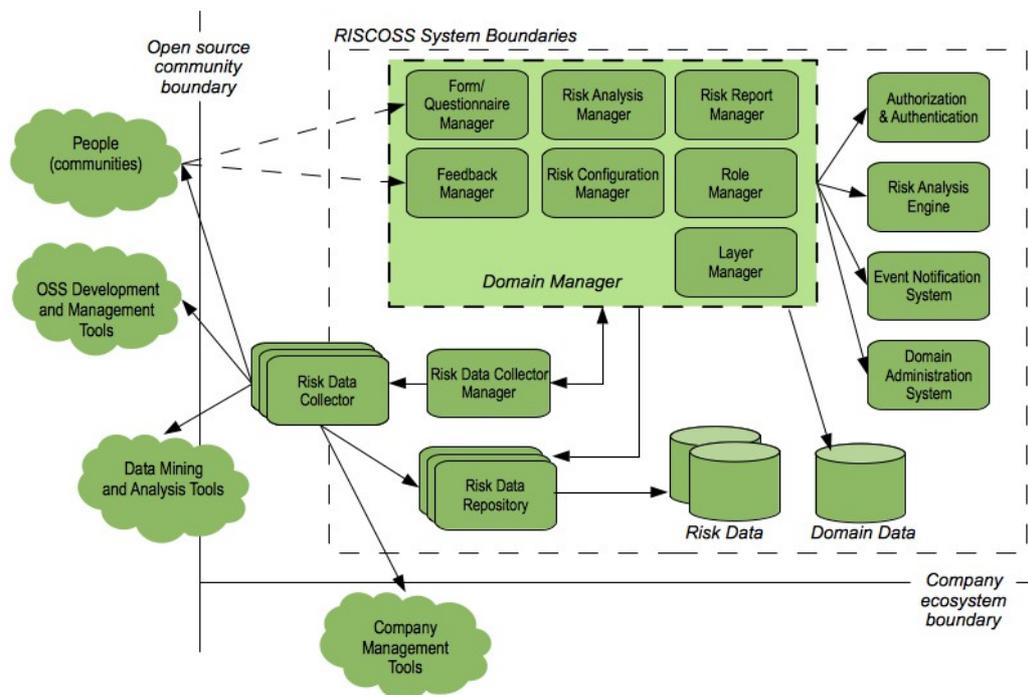

Fig. 4: Architecture overview of the RISCOSS platform

Platform components

These components provide services to all users and all domains of the platform whatever the configuration.

Domain Manager The Domain Manager is the central platform component; it provides isolation for activities performed in the RISCOSS platform. A domain is a container for all the data related to a given context. An entity using the RISCOSS Platform will have its own domain isolated from the others. In each domain, users can specify their own models, layers and roles, and store relevant data for performing specific or customized risk analysis – for example depending on certain business models or providing certain risk reports.

A benefit of the RISCOSS architecture with Domains and Domain Manager is that it allows

for interesting deployment alternatives. For example, a service provider can deploy a RISCOSS-as-a-Service platform where it manages different domains for different customers on a single RISCOSS platform while a company that wants to use RISCOSS in isolation will just create a single domain on its privately deployed RISCOSS platform. A third deployment option could be for an open source organisation such as the Apache Software Foundation or the OW2 Consortium; in this case, the RISCOSS platform is completely public and each open source project is allocated its own domain where it publishes its own data.

Risk Data Collectors Risk Data Collectors are stand-alone components able to collect raw data, which RISCOSS calls Risk Data, from a variety of relevant sources. Their task is to post-process this Risk Data and prepare it for consumption by the RISCOSS platform. In Figure 4 the component is shown partly outside the RISCOSS platform because it can be controlled by users foreign to the RISCOSS platform.

For example, imagine a Risk Data Collector that is able to aggregate data on the distribution of bug-fixing time. In one scenario this component could also be run by an open source community willing to provide this kind of information periodically to a public installation of a RISCOSS platform.

Risk Data Collector Manager This component manages the Risk Data Collectors available in the platform. Via an API, it provides information on what is available, and the parameters they require. It also manages, for example, the execution, the scheduling of the Risk Data Collectors. The Risk Data Collector Manager also provides the means to link the "entities" created in the Domain Manager (see below) to the data collected by Risk Data Collectors.

When the User Layer Manager (see below) creates a component, it is t The Risk Data Collector Manager that asks the user how to configure the Risk Data Collectors that must be run to collect Risk Data for that entity. The Risk Data Collector Manager triggers the data collection process and associates the collected data to the right entity in the Risk Data Repository.

Risk Data Repository This component provides storage and query facilities for storing and retrieving Risk Data. Risk Data Collectors use the exposed APIs to send and store the extracted Risk Data into the RISCOSS platform.

It is possible to have multiple Risk Data Repositories deployed within the RISCOSS

Platform. Some can store publicly accessible data, while others can be used to store private data accessible only from particular contexts. The former is useful to build a public knowledge base whilethe latter is necessary for using RISCOSS in the context of a company, for example, where some data must be protected.

The Risk Data Repository also allows the user to query historical data in order to understand how Risk Data evolve overtime.

Risk Analysis Engine This component contains all the logic for performing the risk analysis using the data available in a given domain. This component also include, for example, business goal impact analysis. In essence, this component provides all the intelligence for computing everything made possible by the RISCOSS Methodology.

The Risk Analysis Engine consists in an API that allows configuring and launching the risk analysis and retrieving the results. It loads risk models forming the knowledge base of the engine.

Authorization and Authentication This component provides authorization and authentication functionalities to the RISCOSS platform. The Domain Manager uses it in order to grant access or not to the resources stored in a domain to a given user.

The Authorization and Authentication component is also used within a domain in order to define the access rules to the data stored there. This can be useful within a company, for instance, where not all personnel can access all, information.

Event Notification System This component provides the functionalities for tracking activities and sending notifications when particular events occur, for example, when a new risk report is created. Events can be notified to users either via the RISCOSS platform user interface or email.

Domain Manager Components

The Domain Manager is a macro-component that manages all data to be manipulated in a given domain. It comprises the following sub-components:

User Layer Manager The User Layer Manager helps reflect the structure and the hierarchy of the user organization within which the platform is used. This component manages entities such as product, product line, business unit, etc., within a hierarchy of layers.

The User Layer Manager provides flexibility to users: layer hierarchies can be different and depend on the context in which the RISCOSS platform is used. In order to address users' current and future needs, this component allows users to completely define their organizational hierarchies.

Role Manager A role defines a class of users, and is used to define the rules for accessing data, and functionalities. This component provides the means to define and manage which roles are actually present in a given domain.

Risk Analysis Manager This component provides the means to define and enforce the process for performing risk analysis in a domain. For example, the Risk Analysis Manager handles controlling and providing information on the status of a risk analysis session in which many users are participating, according to a specific workflow.

The Risk Analysis Manager also handles interactions with the Risk Analysis Engine and required interactions with users via the user interface. These interactions can include, for example, requests for further information on certain aspects of the analysis.

Risk Configuration Manager The Risk Configuration Manager provides the means to manage all the artifacts needed for a risk analysis.

This component takes into account, and organizes rationally all the artifacts needed by the Risk Analysis Engine, as described in the RISCOSS Methodology. This includes, for example, goal models, impact models, etc.

Risk Report Manager This component provides the means to manage the results of Risk Analysis performed in a given domain.

Form/Questionnaire Manager This component provides the means to define and manage user input forms that help users insert information that is needed by the Risk Analysis Engine.

Some of the information can come directly from data previously stored in a Risk Data Repository, but in general, users may be required to manually enter some data - either because it's not possible to retrieve it using Risk Data Collectors or because they want to override some previously collected data.

The Form/Questionnaire Manager can also be used to create custom-made forms to support qualitative data collection from field experts. It is the relation represented in the architecture, Figure 4, with arrows expressing Risk Data Collector "uses" People and People "use" the Form/ Questionnaire Manager.

Feedback Manager This component provide the means to manage user feedback on data managed in a domain. Such feedback can be provided, for example, on risk analysis reports. Feedback is then used to improve the models used by the Risk Analysis Engine for performing the risk analysis.

Future developments

RISCOSS is a research-oriented collaborative project and, as such, is still work in progress. While the methodology is already well defined, the platform development is still in its early stage.

Some significant development remain including extending the range of data sources available. Data sources such as Git, Mark mail, Jira and FOSSology are covered, many more are still to be addressed. In particular, RISCOSS is integrating a new generation of statistical tools able to analyse social networks. As illustrated in Figure 5, RISCOSS will be able to analyse the behaviour of a community over time and how its mesh of collaboration evolves, al useful knowledge to include in a risk analysis.
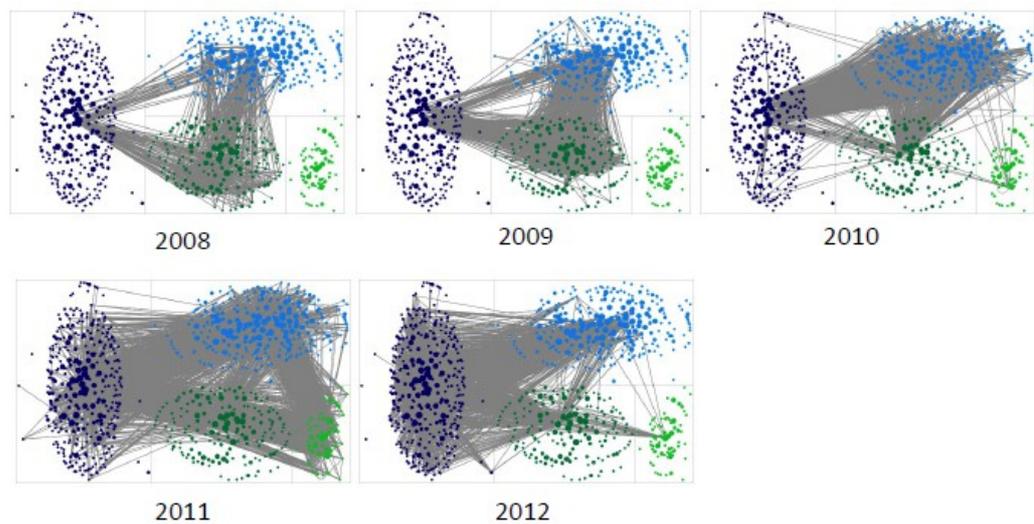

Fig. 5. Social network analysis of a FLOSS community ecosystem over five years

Conclusion

The RISCOSS platform is architected from the ground up to help bring the benefits of open source to the entire enterprise development department. RISCOSS not only enables users to collect informed intelligence on open source components, but also goes one step further by offering risk analysis that adapts to individual business situations.

Based on a unique methodology specifically designed to model business and software ecosystems in the world of open source software, and an extensive architecture able to integrate entire portfolios of dedicated functional components such as the Risk Data Collectors, RISCOSS is the only platform to deliver a complete solution rather than a piecemeal approach enabling mainstream product developers to safely integrate open source software in their developments.

RISCOSS is a research-oriented project that is set to become a reference solution in facilitating industry-wide open source adoption. An open source project itself, RISCOSS is open to third-party contributions to help the platform grow in functionalities and make the transition to a fully marketable product or service.

Download RISCOSS and join the community at www.riscoss.eu.

For more information

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The video capture of the presentation upon which part of white paper is based is available at: http://riscoss.eu and http://www.youtube.com/embed/fwlE2_szQhQ

Related scientific publications

"Managing Risk in Open Source Software Adoption", X. Franch, A. Susi, M. C. Annosi, C. Ayala, R. Glott, D. Gross, R. Kenett, F. Mancinelli, P. Ramsamy, C. Thomas, D. Ameller, S. Bannier, N. Bergida, Y. Blumenfeld, O. Bouzereau, D. Costal, M. Domínguez, K. Haaland, L. López, M. Morandini, A. Siena; ICSOFT 2013, Reykjavík, Iceland. July 2013

"Using i* to Represent OSS Ecosystems for Risk Assessment", C. Ayala, X. Franch, L. López, M. Morandini and A. Susi. iStar 2013 Workshop & CAiSE Conference, Thessaloniki, Greece. June 2013,

VMBO'14 workshop
"Generic vs. Domain-specific Risk Ontologies in Enterprise-level Decision Making".Mirko Morandini, Alberto Siena, and Angelo Susi. Berlin, Germany. March 2014