D-Case Communicator: A Web Based GSN Editor for Multiple Stakeholders

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Abstract. This paper presents *"D-Case Communicator"*, a web-based GSN editor which facilitates co-authoring of GSN diagrams by (possibly) remote stakeholders. D-Case Communicator is easy to use: it can be used in typical web-browsers such as Chrome, Firefox, and Safari; Editing is smooth as it is implemented using recent web technologies. This paper explains basic specification, usage, and design rationale of the tool. D-Case Communicator is available in https://mlab.ce.cst.nihon-u.ac.jp/dcase/.

1 Introduction

There are several assurance cases tools (D-Case Editor [1], AdvoCATE [2], ASCE [3], Astah GSN [4], ...). Most of the tools are stand-alone and require several steps for installation and preparation. For example, some tools require platform for the tools e.g., Eclipse, but it is not easy for ordinary users to install such platform. Recently, web-based technologies have been getting advanced and many stand-alone softwares such as Microsoft Office also have their web-based versions (Microsoft Office 365, etc.). One of the merits of web-based softwares is that they do not require any installation step and platform other than conventional web browsers.

This paper presents "D-Case Communicator", a web-based GSN (Goal Structuring Notation) [5] editor, which facilitates co-authoring of GSN diagrams by remote users. D-Case Communicator is easy to use: it can be used in typical web-browsers such as Chrome, Firefox, and Safari; Editing is smooth as it is implemented using recent web technologies (Docker, Mongo DB, Bootstrap, D3.js, etc.). Also, D-Case Communicator is secure as all data including user information and GSN diagrams are stored in Docker container, and only privileged user (knowing the architecture of the database) can access to and edit the data.

The structure of the paper is as follows. Section 2 shows basic usage of the tool. Section 3 explains design rationale of the tool. Section 4 concludes the paper.

2 Basic Usage of D-Case Comminicator

Figure 1 shows a screenshot of D-Case Communicator.

In D-Case Communicator, users can share and edit GSN diagrams remotely amongst each other via the internet. This screenshot shows

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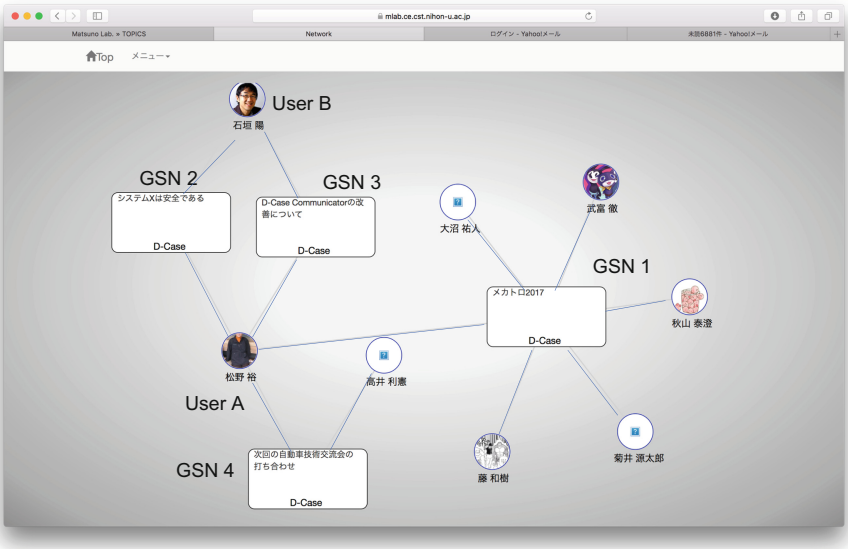

Fig. 1. Stakeholder network view of D-Case Communicator

"stakeholder network" view, which is one of the two main views of D-Case Communicator. For example, GSN 1 in Fig. 1 (robot development for mechatronics contest 2017) is a GSN diagram for a robot being developed in our laboratory, and six users (the author and his students) share the GSN diagram. In Fig. 1, there are also other GSN diagrams: GSN 2 (GSN for "System X is safe") shared by the two users (the author and one of the developers), GSN 3 (GSN for updating D-Case Communicator) shared by two users, and GSN 4 (GSN to be used in a meeting with engineers of automobile companies) shared by the author and one of the participants. The users can only look at and edit GSN diagrams directly linked to them. For example, User A (the author) can look at and edit all the four GSN diagrams, but User B can only look at and edit GSN 2 and GSN 3. Users can together edit GSN diagrams by double clicking the GSN diagrams in stakeholder network view. This stakeholder network view is for User A. In this view, all GSN diagrams which can be accessed by the user are shown.

Figure 2 shows the editing view of GSN 1 diagram. If a user creates a GSN node, moves the node, and writes a description for the node, then other users can see the editing of the GSN diagrams instantly from their own web browser. The current version does not have kinds of access control of a GSN diagram. All sharing users can freely edit the GSN diagram. If one of the users changes the description of a node, the node is instantly updated and other users can see the change after the user completes the edit; but if a user tries to move a node to right and the other user tries to move the node to left, then the node does not move. In our current testing, we observe that an access control is not necessary.

Also, other typical functions in recent web-based tools such as indicating portions of a diagram edited by other users have not been implemented. We plan to implement access control and other functions if there are user requirements for such functions.

Currently, basic kinds of nodes are available: Goal, Strategy, Context, and Solution. We plan to add other kinds of nodes such as Justification and Assumption.

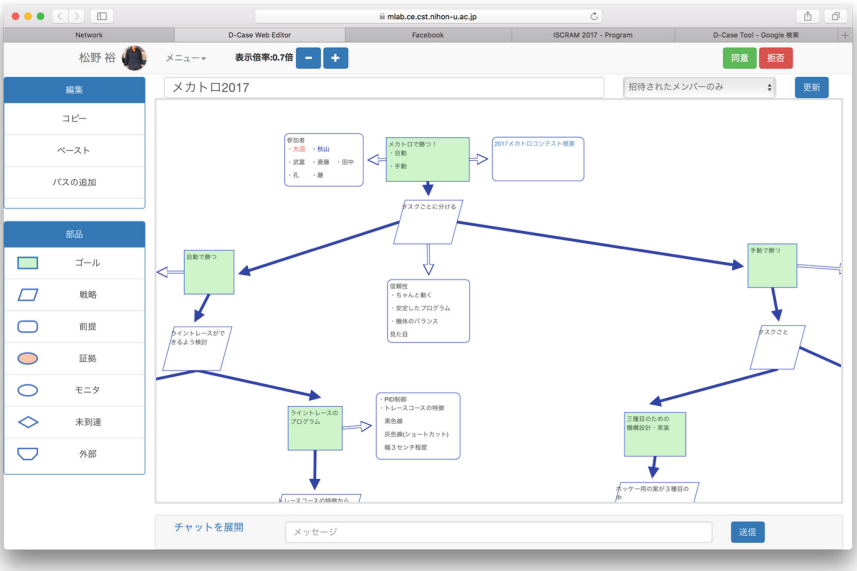

Fig. 2. Editing view of D-Case Communicator

The usage steps are as follows: User registration, searching other users, inviting other users, and co-authoring GSN diagrams. Other functions includes chatting and “agree” or “disagree” button for presenting agreement or disagreement of the GSN diagrams to other users.

D-Case Communicator was used in a GSN workshop held in Tokyo, March 2017. The lecturer and the participants can instantly share GSN diagrams via the tool, and the lecturer can easily present examples and GSN diagrams drawn by the participants using the tool and a projector. Feedbacks from the participants are positive on D-Case Communicator as it is easy to use and the function of sharing GSN diagrams in sync is useful.

D-Case Communicator is available both in Japanese and English. The website is in our laboratory’s web page: https://mlab.ce.cst.nihon-u.ac.jp/dcase/login.html. Also, as it is implemented in a Docker container, D-Case Communicator can be implemented in any local server inside a company.

3 Design Rationale of D-Case Communicator

Over the past six years, we have been trying to spread assurance cases in Japan. We have been organizing assurance case meetings twice for a year, and each meeting has about 30 participants. Some participants said they like assurance cases and GSN, but the penetration of assurance cases in Japan is currently very limited. The main reasons seem to be as follows (from the voices of the participants).

- Tools are limited and not so easy to use.
- Drawing assurance cases is difficult: how to set goal, strategy, ..., are all difficult. The concept of assurance cases and GSN and other formats are easy to understand, but there is not a good guide book.

For the first reason, D-Case Communicator is designed primary for usability and been developed as a web-based tool which does not require any installation steps. For the second reason, some of basic difficulties can be listed as follows.

1. Setting the top goal.
2. Selecting a strategy for splitting the goal.
3. Setting a solution node for the goal.
4. Setting amount of description in a GSN node.
5. Setting the size of a GSN diagram.

There are several guidebooks on constructing assurance cases. However, such guidebooks are either accompanied with detailed description of risk analysis for safety-critical system [6,7] and difficult for a reader who wants to study "argumentation" first in a short time, or seem to be only show a history of safety cases, basic explanation on GSN syntax, and GSN drawing steps [8] briefly extended from the six steps shown in [9]. Unfortunately, those books have not helped us well for resolving the above difficulties.

For these basic difficulties, current our answers are as follows.

1. Setting the top goal by the concerns of the stakeholders.
2. Selecting a strategy for splitting the goal by the concerns of the stakeholders.
3. Setting a solution node for the goal by the concerns of the stakeholders.
4. Setting amount of description in a GSN node according to readability.
5. Setting the size of a GSN diagram at most twenty GSN nodes and it can be shown within one slide. If the size of a GSN (GSN A) diagram is to be more than twenty, then draw another GSN (GSN B) diagram and link it to GSN A. The stakeholders of GSN A and B might be different. For example, if GSN A is drawn by the manager of a system, then GSN B might be drawn by the developers having technical detail of the system, because lower part of a GSN diagram tends to be technical.

The format of GSN is simple and easy to understand, but too free and gives almost no restriction, thus it is difficult to draw GSN diagrams. We introduce the notion of stakeholders explicitly (Items 1, 2, and 3). Goals, strategies, solutions

are chosen according to the concern of the stakeholders. Items 4 and 5 derives from our experience on using GSN: Most effective usage of GSN diagrams is to show and update GSN diagram using a PC and a projector, and discuss with less than five participants (to prevent divergence of discussion). D-Case Communicator can also be used in a meeting where the participants look at and edit the same GSN diagram on their PC in sync, and the GSN diagram is also shown in the projector. In such a use case, a GSN diagram should be with in one slide and the amount of description is limited for readability. In many cases, too big GSN diagrams (e.g., more then one hundred nodes) does not work in our experiences.

Based on the above observation, we introduce stakeholder network in D-Case Communicator. Introducing stakeholders is not a new idea as it is a commonsense in software engineering, but as far as we know, there are not assurance cases tool (currently available) which explicitly use the notion of stakeholders (In [9], stakeholder interest is briefly shown in a node other than basic GSN nodes in a figure, but the detail is not shown; it is said that in SAM (Safety Argument Manager) tool [10], stakeholder interests could be indicated, but currently the tool seems to be unavailable). Also, the interface of D-Case Communicator is designed for drawing GSN diagrams of at most twenty nodes (of course a user can draw a GSN diagram more than twenty nodes if the user wants). D-Case Communicator can link any kind of documents (including GSN diagrams drawn in the tool) on the internet to GSN nodes. Currently we are developing a dedicated linking function from a GSN diagram to another GSN diagrams (simple GSN module system [1]).

4 Concluding Remarks

This paper has presented "D-Case Communicator", a web-based GSN tool for co-authoring GSN diagrams by multiple (possibly remote) users. The tool has been designed based on our experience, and introduced stakeholder network interface. The GSN drawing function is smooth and got good feedbacks from the participants in a GSN workshop. Currently, we are writing a GSN guidebook using D-Case Communicator. Introducing the notion of stakeholder is of course not enough and we need more detailed steps according to each kind of stakeholders (designer, developer, owner, ...,). As a future work, we plan to develop automatic selecting function of goals, strategies, contexts, ..., as briefly discussed in [11]. We would like to report our progress in the near future.

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