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# **SIPHER Layered Systems Mapping Tool: Technical Appendix**

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## Introduction

This document provides information on the systems mapping tool that we developed and used to create SIPHER layered systems map. The tool was created by Paul Norman and is a prototype interactive systems map visualisation tool. The illustrations available to use within the mapping tool were hand drawn by cartoonist and illustrator [Russ Law](#).

If you would like to try out the SIPHER layered systems map tool to create your own map, please contact SIPHER researcher Lisa Garnham ([lisa.garnham@strath.ac.uk](mailto:lisa.garnham@strath.ac.uk)) to explore how we might be able to support you.

The guidance provided in the rest of this document outlines how maps are composed using the tool.

The tool is web-based, allowing maps to be created through a visual editor. Completed maps may then be embedded into other websites.

The maps consist of informational nodes which may be joined together via connectors, and additional, detailed information may be attached to either via hovers or clicks. Images may optionally be added to nodes to enhance user understanding.

The public maps are an HTML, interactive document, but may be saved as static images (without interactive information).

## Technical Information

The tool is written in Node.js (JavaScript) with an HTML, CSS and JavaScript front end. This allows the end result to be delivered to users via a standard web browser (or web-view within an app). It is designed to be viewed on a desktop machine (due to size / complexity of maps) but will work on mobile devices. The most likely publication method would be to embed the desired map into the HTML of another website using an iframe element ([CORS](#) rules may be required).

The map data itself is saved as proprietary, but human readable, JSON files which could be parsed to other formats if desired.

Images attached to nodes are Scalable Vector Graphics (SVG) files which allow the maps to be displayed at any size while maintaining full quality.

It is possible to define colour palettes and choose fonts on a per-map basis, but defaults have been selected to comply with accessibility standards. Fonts available have been limited to those commonly found on Windows machines (~70% of UK market share) with the addition of a couple of more creative, friendly options (which are delivered through the browser).

Other options available have intentionally been kept to a minimum to keep the tool as simple and focussed as possible.

The public maps may be saved in a variety of formats:

- *Webpage (offline copy of the public map – full functionality)*
- *PDF (saved as a single size – no interactivity)*
- *SVG (vector image allowing infinite scalability – no interactivity)*
- *PNG (raster image saved as a single size – no interactivity)*
- *JPG (raster image saved as a single size – no interactivity)*

Printing of large maps may be challenging because browser print support is poor. The best option would be to save the map as a JPG, PNG or PDF file and then print these files.

## Basic Guide

This tool is split into two distinct views, the public user view and the admin editing view. End users will only see the public view, but this guide describes how map creators compose maps in the editing view. This information may be useful if you are considering requesting access to build your own map using this tool.

The tool is designed to **save as soon as any change or action is taken**, you do not need to look for a save button. The editing screen is split into the left, “editing panel”, which will show you details of the component that you are editing, and the system “map canvas.” Items on both are designed to be manipulated using a mouse.

There are fundamentally two types of components that will make up the system maps: **Nodes** and **Connectors**. Both have been kept intentionally simple. **Connectors** can only persist if they are between two **Nodes**. If a system map is reloaded before this connection occurs, the **Connector** will be lost. **Nodes** do not require a **Connector** to persist.

To add **Nodes** or **Connectors**, you must drag them from the top left of the editing panel onto **blank space** on the map canvas.

The editing panel will become populated with more detailed options when either a component or the map canvas itself is selected (clicked). For the map canvas this is referred to as the **Global Options**, and this controls the options available to the **Nodes** and **Connectors**. It also controls the available **Layers**.

The system keeps a history of actions taken in a single session, you may therefore undo or redo actions using the buttons at the top left of the editing panel. **If you are hovering over the canvas area** of the page, you can additionally use the **ctrl + z** (*undo*) and **ctrl + y** (*redo*) shortcuts. This history is kept in your browser only for as long as you are on the page, if you leave or refresh the page the history will be lost.

Every time an individual system map is loaded into the tool, a backup is taken which can always be reloaded as the main record.

Multiple selection of **Nodes** via click-and-drag is possible, but **you must hold down ctrl** whilst performing this action to select any **Nodes** in range. A red overlay will appear (with individually selected **Nodes** highlighted), and this area can then be dragged, deleted or moved with the arrow

keys. Clicking outside this red area (on the map canvas) will dismiss the selection. **ctrl + a** may also be used as a shortcut to select all **Nodes** on the current **Layer**. To add or remove additional **Nodes** from this area, **ctrl + click** them.

## Layers

**Layers** are a bit of a misnomer, it's better to think of them as separate maps that are kept in sync with one another. They are all separate lists of **Nodes** (and their **Connectors**) and are mostly purely duplicated data. For example, if a **Node** exists on all **Layers**, it will have the same ID and may be manipulated jointly (e.g. moved or renamed), but will actually be stored multiple times. This allows individual layers to manipulate (or even delete) **Nodes** independently without impacting one another or all **Layers** to be edited together (default). This also means that **Layers** cannot actually be "layered", only swapped between.

**Layers** may be managed (renamed / reordered) via the **Global Options** panel, but swapping between them is performed using the small menu in the top right of the page.

Next to the **Layer** swapping menu (at the top right of the page) there is an additional button that allows layers to be edited independently. If this is in its green, linked state, all changes performed will occur on all matching components on all **Layers**. If this is in its red, unlinked state, then any action that you take will only affect the **Layer** that you're working on - this includes deletion of components.

**N.B.** If you delete a **Node** or **Connector** on a single **Layer**, it can be restored using the "Layers" section of the editing panel for the component.

## Global Options

It's best to start here, because this panel allows you to define the colours / fonts / layers etc that you will have available to you throughout the editing process.

The global options are accessible by clicking in empty space on the map canvas.

### Meta

This only allows the control of the map name, but this is the name that will appear in the public tab title, so it's important.

## Layers

Any number of **Layers** may be defined at any time, but when creating a new one, you need to select an existing **Layer** to copy from (for reasons mentioned above). The new **Layer** will become immediately available and may be reordered via drag-and-drop. The first **Layer** will be the default view for the user. If you delete a **Layer**, it is permanently gone, so be careful!

## Fonts

Text in **Nodes** will only have the fonts that you shortlist here available to them. They may be reordered via drag-and-drop and the top font will be the default applied to new **Nodes**. If you delete a font, all **Nodes** previously using that font will turn into the (potentially new) default font.

It is also possible to set the default font size and line height for new **Nodes**.

## Colours

There are colours to control several system components, but they are all defined in the same way. They may be reordered via drag-and-drop and the top colour will be the default applied to new components. If you delete a colour, all components previously using that colour will turn into the (potentially new) default colour. Several options always start as transparent (which is always available).

Scalable Vector Graphics (SVG) resizing is controlled away from the editing panel. Around the map canvas (in the editing view) are 4 boxes with small arrows in them; clicking any of these will pop up a small box with a green (plus) button and red (minus) button. These increase or decrease the size of the canvas in that direction by 20 pixels with each click. Click anywhere outside this box to dismiss the popup. If a component disappears underneath an edge, don't worry, you can add more space to the map canvas to retrieve it.

## Nodes

To add new **Nodes**, you must drag them from the top left of the editing panel onto **blank space** on the map canvas. If a **Node** already exists with a style that you like, you may also select it, copy

it by pressing **ctrl + c** and then in open space, press **ctrl + v** to paste a copy with the same styles applied. This **Node** will have its own ID and content.

**Nodes** can be moved around the canvas via drag-and-drop. Any connectors connected to the node will move with the node. When selected, a node may also be moved by pressing the arrow keys to move it a single pixel in that direction.

Clicking on a **Node** will allow you to edit its options and customise it via the editing panel.

To delete a **Node**, click it to bring up the editing panel options and then press the **Delete** key. Deleting a **Node** will also remove any connectors to or from it. It's also possible to delete (or restore) Nodes from the editing panel (see Layers below).

## State

It's possible to disable (grey out) or completely hide a **Node**. Hidden **Nodes** will still be visible in the editing view (for spacing management), but will not appear at all in the user view.

## Box

New **Nodes** begin with an invisible box around them containing 20 pixels of internal padding. This space may be coloured with any colour defined in the **Global Options** -> Colours section. Exterior padding may also be added to provide a space between the box and the connectors.

Boxes may also have a border, which also has a colour, a thickness and a corner radius (increase this to make more rounded / circular boxes - you may need more padding though!).

## Text

Simple text may be added into **Nodes**. It can be on multiple lines, but may not use formatting such as bold or italics.

If an image is also present, the text may be aligned in any of 9 possible ways (*think of a tic-tac-toe board*). It's best to play with these items to understand them.

The font, colour, size and line-height may be chosen for the text. The font and colour options are defined in the global options.

## Image

An image may be optionally added to a **Node**. Pressing the green, search button will bring up a modal window that allows a choice of images. Once an image in the modal window is clicked this will be added to the **Node**. It may then be resized accordingly.

Searching is performed using pre-determined tags. Start typing in the search box and the choices available will be listed. These must either be clicked or tab / enter may be pressed to select the top item.

## Interactivity

This section refers to adding hover information and (double) click handlers to the public user map view. These will only appear when the **Node** is hoverable / clickable respectively even if the data is populated.

Pressing the edit button next to either option will open a modal window to allow editing of the information that will be shown to the user when the relevant action is taken. Titles are optional. The entered data will be presented to users as HTML and may contain formatting.

## Layers

The Layers section shows which **Layer** this **Node** exists on. Unchecking a box is analogous to deleting a **Node**, but checking a box will restore the **Node** to the corresponding layer. This will not restore **Connectors** (they must be restored manually using the Layers section from the relevant **Connector** editing panel).

## Connectors

To add new **Connectors**, you must drag-and-drop them from the top left of the editing panel onto **blank space** on the canvas.

**Connectors** may be moved to different **Nodes**, or to different connection points within **Nodes**.

To connect a **Connector**, the simplest method is to click it once and then click and drag it from one of the circles that appears at either end. Once picked up, that end may be dropped on any

**Node**. If it is dropped on the centre of a **Node**, the closest connection point will automatically be chosen. Alternatively, you may choose to drop it on a connection point circle around the edge of a **Node**, this will force the **Connector** to use that point no matter where you drag the node. This may be altered at any time.

To delete a **Connector**, click it to bring up the highlight options and then press the **Delete** key.

## Attributes

It is possible to choose the **Connector** colour, thickness, style, type and end markers. The types available are only basic, but arcs have the options to be inverted if the arc is in the wrong orientation.

## Interactivity

This section refers to adding hover information and (double) click handlers to the public user map view. These will only appear when the **Connector** is hoverable / clickable respectively even if the data is populated.

Pressing the edit button next to either option will open a modal window to allow editing of the information that will be shown to the user when the relevant action is taken. Titles are optional. The entered data will be presented to users as HTML and may contain formatting.

## Layers

The Layers section shows which **Layer** this **Connector** exists on. Unchecking a box is analogous to deleting a **Connector**, and checking a box will add the exact **Connector** back. This is only possible if both the start and end **Node** for the **Connector** already exist on the **Layer** the action is being performed on.

## Access

This Technical Appendix outlines the development and functionality of the systems mapping tool used to create SIPHER's layered systems map. The tool offers a flexible and interactive way to visualise complex systems, and its web-based platform ensures accessibility and ease of use.

If you are interested in exploring how this tool might support your own work or would like to discuss potential collaborations, please contact Lisa Garnham at [lisa.garnham@strath.ac.uk](mailto:lisa.garnham@strath.ac.uk).

## Working together to tackle health inequalities and improve the health of the public.

The conditions in which we are born, grow, live, work, and age are key drivers of health and health inequalities. Preventing illness related to these 'social determinants of health' requires well-coordinated policies across many sectors, such as the economy, welfare, housing, education, and employment.

SIPHER's innovative systems science approach offers a powerful framework to explore the complex real-world relationships and interdependencies of diverse policies that shape our public health and wellbeing.

A major research investment by UKPRP, the SIPHER Consortium is a collaboration of policy and academic experts working with practice partner organisations to create evidence-based products that deliver improved public health policy.

### Policy Partners



### Academic Partners



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