# STEP-BY-STEP TUTORIAL FOR EASYSMPC

EasySMPC is a simple application to calculate sums over distributed data easily using Secure Multi-Party Computation protocols. The current version of EasySMPC is available at <a href="https://github.com/prasser/easy-smpc">https://github.com/prasser/easy-smpc</a>.

There are two processing modes within the EasySMPC application: (1) *manual mode* and (2) *automated mode*. In the manual mode, the installed email program can be used for manual sending and receiving of pre-generated emails. Here, other methods of communication such as chats could also be employed. In the automated mode, each user configures a way of communication (e.g. mailbox or the EasySMPC own backend) to exchange data automatically. Data security is guaranteed in both modes.

EasySMPC is project or study orientated, meaning that the calculation of one or several sums with several parties is always bound to exactly one study. During a study, EasySMPC knows two types of roles: (1) the *creator*, who initiates a study defining its title, participants, variables and processing mode; (2) the *participants*, who initiate their study participation, enter their respective data to the pre-defined variables and, if necessary, their connection details. Each EasySMPC study has exactly one creator and two or more participants. Which actions to take in each role with each mode is described below in detail.



Remark: This document describes EasySMPC, when used with the Graphical User Interface (GUI). EasySMPC also offers a command-line interface, which is described in the readme documentation of the GitHub repository.

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# 1 Prerequisites

#### Installation

To use EasySMPC, please download the software from <u>https://github.com/easy-smpc/easy-smpc/releases</u>. Here, you can choose between installation packages for the operation systems Windows, Linux or MacOS. Moreover, EasySMPC can be downloaded as an executable jar-File. After installation, the user can start the software from the respective entry in the programs library or with the link on the Desktop.

#### Preparing data

The user needs to provide the data in a format suitable for EasySMPC: The software supports files in the format of Comma Separated Values (CSV) and in Microsoft Excel (".xls" and ".xlsx"). The data needs to be row-oriented (one row for each entry) and must have at least two columns. The last column is regarded as the data value and therefore must always contain numbers only. A single dot a as a decimal separator is allowed but not necessary. In case of exactly two columns, the first column will be regarded as the sole data description. In the case of more than two columns, EasySMPC will concatenate all columns of a row except the last column to a single column and use this as the data description of the data (see Figure 1 for an example).

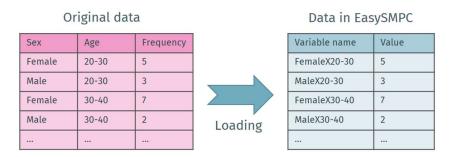


Figure 1: Original data and its representation in EasySMPC

#### Choosing a mode

Before starting a new study with EasySMPC, please decide which mode you want to use, the *automated* or the *manual mode*. This decision cannot be changed during the study after it has been defined by the creator. It applies to all participants in the study. If you decide for the *automated mode*, make sure that all participants know the necessary details to connect (see step 2 in chapter 2.2). However, it is always possible to start a new study using another mode.

#### Clipboard

In *manual mode*, EasySMPC makes use of the *clipboard*, which basically refers the usage of the popular *copy* and *paste* mechanisms (e.g. the key combination of *control* + c and *control* + v on many operating systems). If you are not familiar with these functionalities, please make yourself familiar with them e.g. with the respective <u>Wikipedia article</u>.

# 2 Creator

### 2.1 Manual mode

#### 2.1.1 Step 1

To create a new study, first start EasySMPC and click on *Create connection*.

EasySMPC - Simpl	e Data Sharing With Secu	re Multi-Party Computing	3		- 🗆 ×
Action Help					
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		Sta	art		
			nnection		
		Create co			
		Load			
		Create no	ew study		
		Participat	e in study		

Figure 2: Entry perspective of EasySMPC.

# 2.1.2 Step 2

Click on *Select*. For the manual mode no other configuration is necessary.

(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Resu
		-	Start	11	
	E-mail connect	tion properties		×	
	Manual E-mai	EasySMPC backend			
	Manual data exchan	ge. You will exchange string:	s by means of your choice	(e.g. e-mail chat program).	
	Cancel	Add	Remove	Select	
		1	1	1	

#### Figure 3: Connection selection.

#### 2.1.3 Step 3 Click on *Create new study.*

EasySMPC - Simple	e Data Sharing With Secu	re Multi-Party Computin	g		- 🗆 X
Action Help					
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		St	art		
		Create co	nnection		
			study		
			ew study		
		Participat	e in study		
				Set	t manual data exchange

Figure 4: Create a new study.

#### 2.1.4 Step 4

Enter the name of the study as well as the name and the e-mail addresses of the participants. Afterwards click on the button *Load variables and values from file*.



Remark: Red-bordered fields indicate that the content of a field is not correct and needs to be corrected. In this case, the name of the first variable needs to be provided.

EasySMPC - Simple	Data Sharing With Secur	e Multi-Party Computi	ng			- [	
Action Help							
(1) Start	(2) Send	(3) Receive		(4) Send	(5) Receive	(6) R	esult
General data		Creat	te study				
Study name: PKU com	orbidities						
	details in the first entry)						
Full name: Hospital 1			E-mail:	creator@hospit	al1.org		+-
Full name: Hospital 2			E-mail:	participant@ho	spital2.org		+
Full name: Hospital 3			E-mail:	participant@ho	spital3.org		+-
Variables (add your dat	a here)						
Variable:			Value:	0			+ -
		Load variables a	nd values	from file			
		Remove					
		Save an	d procee	d			
					Using	g manual dat	a exchange

Figure 5: *Start* perspective of EasySMPC filled out partly.

### 2.1.5 Step 5

Select a Microsoft Excel or CSV file in the now opened file browser. Browse to the folder of your data, select it and click Open.

EasySiVIPC - Simple	Data Sharing Wit	th Secure Multi-Party Comput	ing		$ \Box$ $\times$
Action Help					
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		Crea	ate study		
General data	🧿 Open			×	
Study name: PKU com				_	
Participants (add your c	Suchen in:	PKU study	× 1	* K 🗄 🗄 .	
Full name: Hospital 1	data PKI	U.csv			+ -
Full name: Hospital 2					+ -
Full name: Hospital 3	-				+ -
Variables (add your data					
Variable:	Dateiname:	data PKU.csv			· · ·
	Dateityp:	All Files			
			Ор	en Cancel	
			Ор	en Cancel	
		Load variables	Op and values from file	en Cancel	
				en Cancel	
		Remove	and values from file	en Cancel	

#### Figure 6: File browser of EasySMPC.

### 2.1.6 Step 6

The data now appears in the bottom section of EasySMPC. You can click on Save and proceed.



Remark: Loading of data from a file is not necessary. You can also add variables and values manually.

Remark: The study name, the participants' names and e-mail addresses as well as variable names will be shared with **all other** study participants. The data you entered in the *Value* fields is **secured** and **will not** be shared.

	elp	1		1	1		
(1) St	tart (2) Send (3) Receive		(4) Send	(5) Receive	(6)	Result	
		ate study					_
General da							
Study name	e: PKU comorbidities						_
Participant	ts (add your details in the first entry)	_					
Full name:	Hospital 1	E-mail:	creator@hospit	al1.org		+	Ŀ
Full name:	Hospital 2	E-mail:	participant@ho	ospital2.org		+	•
			: participant@hospital3.org				
	Hospital 3	E-mail:	participant@ho	ospital3.org		+	Ĩ
	Hospital 3 add your data here)	E-mail:	participant@ho	spital3.org		+	
Variables (i		E-mail: Value:		spital3.org		+	
Variables ( Variable:	add your data here)	Value:	3	spital3.org			
Variables (; Variable: Variable:	add your data here) N.18.1-5 Chronic kidney disease, stage I-V	Value:	3	spital3.org		•	
Variables (; Variable: Variable: Variable:	add your data here) N.18.1-5 Chronic kidney disease, stage I-V G31.9 Degenerative disease of nervous system, unspecified	Value: Value:	3 5 1	ospital3.org		+	
Variables (; Variable: Variable: Variable: Variable:	add your data here) N.18.1-5 Chronic kidney disease, stage I-V G31.9 Degenerative disease of nervous system, unspecified G31 Circumscribed brain atrophy	Value: Value: Value:	3 5 1 2	spital3.org		+	
Variables (; Variable: Variable: Variable: Variable:	add your data here) N.18.1-5 Chronic kidney disease, stage I-V G31.9 Degenerative disease of nervous system, unspecified G31 Circumscribed brain atrophy F32.x Depressive episode	Value: Value: Value: Value: Value:	3 5 1 2 6	ospital3.org		•	

Figure 7: Start perspective of EasySMPC filled out completely.

### 2.1.7 Step 7

After clicking on *Save and proceed* a file browser opens to choose a location of your project file generated by EasySMPC. The file will store all relevant information necessary for your study. EasySMPC allows closing a file, stopping the processing and re-opening at a later point in time (see section *Saving, closing and re-opening a* study file).

			th Secure Multi-Party				
Action H	Help			[			1
(1)	Start	(2) Send	(3) Rec	eive (4)	Send	(5) Receive	(6) Result
				Create study			
General d	lata	Save				×	
Study nan	me: PKU come						
Participa	nts (add your d	Speichern in:	PKU study		~ 1	* 8 8 8	
Full name	e: Hospital 1						+ -
Full name	e: Hospital 2						+ -
Full name	e: Hospital 3						+ -
Veriebles	(add						
	(add your data					-	
Variable:	N.18.1-5 Chro	Datainana	DVII and dis				••
Variable:		Dateiname:	PKU_project_file				••
Variable: Variable:	N.18.1-5 Chro	Dateiname: Dateityp:	PKU_project_file SMPC Study				
Variable: Variable: Variable:	N.18.1-5 Chro G31.9 Degene				Sa	/e Cancel	• •
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Variable: Variable: Variable: Variable: Variable:	N.18.1-5 Chro G31.9 Degene G31 Circumsc F32.x Depress	Dateityp:	SMPC Study			/e Cancel	+ · · ·
Variable: Variable: Variable: Variable: Variable:	N.18.1-5 Chro G31.9 Degene G31 Circumsc F32.x Depress	Dateityp:	SMPC Study sorder Load v	Value: 6 ariables and values fro Remove unused lines		ve Cancel	+ - + - + -
Variable: Variable: Variable: Variable: Variable:	N.18.1-5 Chro G31.9 Degene G31 Circumsc F32.x Depress	Dateityp:	SMPC Study sorder Load v	ariables and values fro		ve Cancel	+ · · ·

Figure 8: Save the project file generated by EasySMPC.

## 2.1.8 Step 8

Now the first Send perspective opens. It allows the generation of prepared messages to the other participants. The first line is your own contact data and is displayed for your information only. You can ignore it.

		ita Sharing With Secu	ire Multi-Party Computir	g			- 🗆	×
Action He		(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Result	t
25 (N 27)			Send y	our data	6			
General dat Study name	ta e: PKU comor	bidities						
Participant								
Full name:	Hospital 1			E-mail:	creator@hosp	ital1. <mark>o</mark> rg	Send e-mail	-
Full name:	Hospital 2			E-mail:	participant@h	ospital2.org	Send e-mail	4
Full name:	Hospital 3			E-mail:	participant@h	ospital3.org	Send e-mail	4
			Manually send all	pending	messages			

## 2.1.9 Step 9

Click on button Send e-mail manually in the second line. Three options appear. Click on Send e-mail manually.

	lp	-		1
(1) St	art (2) Send	(3) Receive	(4) Send (5) Re	ceive (6) Result
25 (h 17)		Send your dat	a	м <u>.</u>
General dat	ta e: PKU comorbidities			
Participant				
Full name:		E-mai	l: creator@hospital1.org	Send e-mail 🖌
Full name:	Hospital 2		l: participant@hospital2.org	Send e-mail 🛩
Full name:	Hospital 3	E-mai	l: participant@hospital3.org	Send e-mail manually
			)L	Copy e-mail text

Figure 10: Send perspective in EasySMPC sending an e-mail manually.

#### 2.1.10 Step 10

Your e-mail application (in this case Mozilla Thunderbird) will pop-up with a generated e-mail. You can send the e-mail out without any changes.

🖌 Write: Data exchar	nge study PKU comorbidities 0/2 - 1	hunderbird – 🗆 🗙	_
	rt F <u>o</u> rmat O <u>p</u> tions <u>T</u> ools <u>H</u> el		
🖪 Send 🛛 🎝 Spellin	ng 🗠 🔒 Security 🗠 🗈 Sav	0 Attach	~
From	dic@charite.de	✓ Cc Bcc ≫	
То	dic@med.uni-heidelberg.de		
<u>S</u> ubject	Data exchange study PKU comor	vidities 0/2	
Body Text 🗸 🖌 Varia	able Width 🗸 💻 🕆	「 T+ T+   B I 旦   参   田 垣 垣 垣 垣 = 図 > ③ >	
Hello DIC Heidelb	oerg,		
please start a stu	dy participation by using th	e following text:	
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		r/n32xnv2yTWuaHteqNfuCxl3czX5rHeI+vmNxnd1tu2NRZ3+2Zr87pqRoirTuVhMcovQlYE+z72c/s2a/fp104iq9PHxuZjC6X/3tuOGQHDoDUp5L	
		:QHh84YBZRtA7GhOssTOT4s1v1+Vi2MMqQHGXKi0OcSgc+p7pe7QCrxvkTK3GSRwM5x1J/oipXBGa2iip3I3EX3fGdjfd9Tw3/AujYkocNFgcdZgl aco4BlFaLvTm5xWqz7RtRMepB01YE1FIrCXTQAX4j3EoZwntTfC+jbgjt7Se979hbfwlrfkwjwXB04DOCeqTvvm18Rbpr5vesYKPWRISQ10HaEPmnbJ	
		htq-QZmTsSFnwlDhZLgd3Q86jgXbVXEJIXSAKKR5khR9Dp9G86VZNO4ludTh/pdOqb3ZINwvp+hBwpO4RWSaV10LzGDfcaEXKI0eeQqn0uFyMOnACCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	
		nx1WC7g6ZyursWH2ScUOa71rsC6ydCuXceiwCC5LkSdtaryVTcu/8Ow/w/NdDOInYvC1R6FZLAfcqNkaofIMPpeH+OqT4NUngcbFigSaUxM8wUD/YcNN	
		7kVq+EMcBjOAnkcP9TPN83mrqXojPSti9bgbc4VJB5wTYRYEYeejQOxpnpultmp4tAc6Ursk7phpJKUNPTYrvY7eNdOdGkO54zbCz4H+3DwTCcCqxOYBy nySWBCbHHLQDq2USzIPUoN9e7jsZx+bl59C/Du0zhqd5mualvs+s5l1n24+8SY5+NVp+XncJ+RsUArwEly2rtPp+8ajpONjW+VnbJ/pq2aGs5ljQz1	
		$\label{eq:construction} \\ \begin{tabular}{lllllllllllllllllllllllllllllllllll$	
		JZBzqGM90XPxZW/rp8bwX8pblo5Vz+3LJ9Wu9sVho94JFn6bN30VjXYhLqa8EcOcalpDq32GQ7khAvSB8H+YiwuW9JEOG0saeNlpF1JfWeu+eeRzUoRv	
		'gz2pgGP9/+WjiYW6OSlf04E76nxyXnStltRvvSUCH3fi48lZGiFuqFcit9b5PhEmXmxM5mY5zV3f6X6U+RPEbn7wRM/Wg/VLO5l47DWCKySPtmPy+ .nfP+q75V3/7v00LUzxQbYkF7Q08vMlqKnOK+w/w1w9GRqnx4cE+F17qv3S42Wse8P03XTV1nz9Znm5h/7iirXymoiTD1NPA47Mqi613fZWTF2vnEfY	
		mirydysy/Youdzaulasyddyswydanar a cynaeth yr araen yr yn araen yr yn ar yn Rybl/4EGEwlu6znull63AulcSu/yb/RibliolonobopKtx7icG5xK3qd1hhf3ygP39+mul/USHw8MdE8Nuku6G7/7WuclbeEMiWVKh51On	
uqzX8b9cFN7oTd		+B+HVL2KKFtLjXD4ptu9ntakG+rlN6e6uJPeVrQlCXpMbulaTf7Ul0rfzBen/0LEwPXPGwLAAA=	
END_PAYLOAD			
With best regards	s		
DIC Charité			

Figure 11: Pre-generated e-mail in Mozilla Thunderbird.

### 2.1.11 Step 11

After sending the e-mail with your e-mail program, you can return to EasySMPC. The software will ask you whether the e-mail has been sent correctly. If so, please indicate this with a click on Ok.



Remark: After clicking on Ok, you can still have the e-mail generated a second time, e.g. when there was a problem receiving the e-mail by one of the participants. However, after leaving the perspective (step 13), the message cannot be generated anymore.

EasySMI	PC - Simple Dat	a Sharing With Secur	e Multi-Party Computi	ng			- 0	×
Action He	lp							
(1) St	art	(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Result	t.
			Send	your data		,		
General dat								
	PKU comorb	idities						
Participant				1				
Full name:	Hospital 1			E-mail:	creator@hospit	al1.org	Send e-mail	~
Full name:	Hospital 2			E-mail:	participant@ho	ospital2.org Send e-n		~
Full name:	Hospital 3			E-mail:	participant@ho	spital3.org	Send e-mail	4
		0	Please confirm that yo	ou have se		ancel		
			Manually send a		messages			
			Pr	oceed				

Figure 12: Confirm sending in the Send perspective of EasySMPC.

# 2.1.12 Step 12

Now the checkmark in the second line has turned green.

	lp	ita shanng with seed	re Multi-Party Comput	ing			- 0	×
(1) St		(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Result	t.
			Send	your data				
General dat								
	PKU comor	bidities						
Participants				F		-14	Send e-mail	
Full name:				_	creator@hospit			
Full name:	Hospital 2			-	participant@ho		Send e-mail	~
Full name:	Hospital 3			E-mail:	participant@ho	spital3.org	Send e-mail	4
			Manually send a	Il pending	messages			

Figure 13: Send perspective in EasySMPC after sending the first e-mail.

### 2.1.13 Step 13

Repeat the sending process for all outstanding participants. Once this is finished and all checkmarks have turned green, you can click on *Proceed*.

	PC - Simple Dat	a Sharing With Secu	re Multi-Party Computir	ng			- 🗆	$\times$
Action He	elp							
(1) St	tart	(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Resul	t
			Send y	our data				_
General da Study name	ta e: PKU comork	idities						
Participant	s							
Full name:	Hospital 1			E-mail:	creator@hospit	al1.org	Send e-mail	~
Full name:	Hospital 2			E-mail:	participant@ho	spital2.org	Send e-mail	~
Full name:	Hospital 3			E-mail:	participant@ho	spital3.org	Send e-mail	-
			Manually send al	nending	DD ges			

Figure 14: Confirm sending in the Send perspective of EasySMPC.

Remark: You can also click on *Manually send all pending messages* to have e-mails generated for all outstanding participants. A prepared e-mail will be opened for each outstanding participants.



Remark: In some cases the security constraints on the operating system will prevent EasySMPC from starting the e-mail program. In these cases you can select *Copy e-mail text* after clicking on *Send e-mail*. The content of the e-mail is then copied into the clipboard from which you can paste it into an e-mail after opening your e-mail program manually (or any other communication method such as chat programs).

## 2.1.14 Step 14

EasySMPC displays the next perspective: *Receive*. Here, you need to wait for e-mails sent by the other study participants. Once you received an e-mail by another participant, click on *Manually enter received data*.

EasySMI	PC - Simple	e Data Sharing With Secur	e Multi-Party Computing	9			_		$\times$
Action He	lp								
(1) St	art	(2) Send	(3) Receive		(4) Send	(5) Receive		(6) Result	
_			Receiv	e data					
General dat Study name	-	norbidities							
Participant	s								_
Full name:				E-mail:	creator@hospit	tal1.org			~
Full name:	Hospital 2	2		E-mail:	participant@ho	ospital2.org			~
Full name:	Hospital 3	l .		E-mail:	participant@ho	ospital3.org			~
			Manually enter	receive	d data				
			Proc						

Figure 15: The Receive perspective of EasySMPC.

### 2.1.15 Step 15

Open your e-mail program, highlight the entire text you received and copy it into the clipboard.

🖉 Write: Data exchange PKU study - Thunderbird	⊆ <u>∎</u> x)
Eile Edit View Insert Format Options Tools Help	
📣 Send 🛛 🗛 Spelling 👻 🖴 Security 👻 🗈 Save 👻	Attach 🗸
From participant@hospital2.org	✓ Cc Bcc ≫
To creator@hospital1.org	
Subject Data exchange PKU study	
Body Text 🗸 Variable Width 🗸 🖣 🕁 T+ 🖪	I ⊻ & ∺ ⊭ ऌ ॡ ≣× ⊠× ©×
	LigM IfAMIYSu+mGmYI2PyYGLANF32lvkPy+iB9mb5DP5ssk03TaitVLRYMMy2853vzliffht8Xu0G39LovG5+oHIXV2Wm9Tkiq/ cU17gefG1s885f2LilLb31bl3E3xuDf2vlrMt1VHT1Hg5NugOwu8GPg1fG4Ms/bl2cR6eXc3lvGLyq3 20q0hlWFgMkupwqdIZwduss9mvLdtRRLl6pNY74bbkPXDb87/FLPXFJMGxGecS10FfC7xBy1ZAO28vsIXXgA1+Edg mVTMkH7cFMQ/5ssh0jlC1cvx65Ca+h655s82m0PNePu2Cl2Pq35gldanQmtXtV:2Mr68UhCVH6q5b0L5fzGw17CKC1GAleg byhLGsh05do+1021jLu02DXtKnr53Jxv12z8hx/Wmmjadpddk41yHcqUUH+L0a2p7R59j82/rWfsjEP6Aev18HF2xH60 JeFC1059P2116jbU27XkRyU0x5743bzu17q475y7MjMGb06H5K38p5v10GecKk9p9Mb1(eqiclinFx58Pr5NibyPw07 Jg62VxX5tf8c73gs1100mVk2Zg03Ro7HtH2BuNdQq5F5S5G40P72/W3Yc06kr1b575bd27bubMb0P2c06H48dVqda9FvxXcC 2pbPc9crWM5KC5F28PP8D0H8b-10j1q311SB3WU2gMuXlpyG8mM6yzbHrpA+4x8P78hLs9M9Pm07tsr64L1D Qbcg1g19A/3twkal9C3Vf12F3Gg0RY220Jg8NYtN/5bDq5E8Z5y+H6hlqu2P9rMOqaiFW2gW3mw1W07759523Li+3aA3O mdw1Cq2Mx2po4aS5maeGLb5/ajB8c17.32f5smAxWU77xx5bxVNQajjCaF6D+712P32FBmy6k6VGQV-QaID HfdzPRWHvfgStKRD3uzhOSbky4ZEh0yGMY/Hu22SKD2Fw5TrQG8Arw1/XtF1M24bur9
With best regards	
Hospital 2	v

Figure 16: Received e-mail displayed in Mozilla Thunderbird.

## 2.1.16 Step 16

Open EasySMPC again, click into the red-bordered field and click on *Paste*. Proceed by clicking on the now activated *Ok* button.

ction He	p				(		
(1) St	art (2) Se	end (3) Recei	ve	(4) Send	(5) Receive	(6) Result	t
			Receive data				_
General dat	-						
	PKU comorbidities						
articipants							
ull name:	Hospital 1		E-mail:	creator@hospit	tal1.org		
ull name:	Hospital 2		E-mail:	participant@ho	ospital2.org		•
ull name:	Hospital 3	🤨 Enter da	ta received		×		
				ne data you rece	in the second se		
			Cancel		Ok		

Figure 17: Copy data into EasySMPC.

## 2.1.17 Step 17

The successful receiving of the message is reflected in the status line as well as by the green checkmark.

EasySMPC -	Simple Data Sharing With Se	ecure Multi-Party Computing				-		$\times$
Action Help								
(1) Start	(2) Send	(3) Receive		(4) Send	(5) Receive	(	6) Result	
		Receive	data					
General data								
	KU comorbidities							
Participants								
Full name: Ho				creator@hospit				Š
Full name: Ho	spital 2	E	-mail:	participant@ho	spital2.org			
Full name: Ho	spital 3	E	-mail:	participant@ho	spital3.org			~
		Manually enter		d data				
		Proce	eed					
					Message(s) 1 out of 2 m	essages :	set succe	ssfully

Figure 18: The *Receive* perspective of EasySMPC after receiving a message.

Remark: Since EasySMPC is reading the clipboard continuously, in most cases copying the e-mail to the clipboard as shown in step 13 is sufficient and the steps 12 and 14 are not necessary.

#### 2.1.18 Step 18

Repeat the receiving steps until all checkmarks turn green. Then click on Proceed.

EasySMI Action He		ata Sharing With Secu	ire Multi-Party Computing	g			-		×
(1) St		(2) Send	(3) Receive	6	(4) Send	(5) Receive		(6) Result	t
			Receiv	e data					
General dat		- hiddaine							
Participants	PKU como	orbidities							
	Hospital 1			E-mail:	creator@hospit	al1.org			-
	Hospital 2				participant@ho				-
	Hospital 3				participant@ho	-			-
			Manually ente						
				ceed					
					л.	Message(s) 2 out of 2 m	nessages	set succe	ssfu

Figure 19: The *Receive* perspective of EasySMPC after receiving all messages.

### 2.1.19 Step 19

The following *Send* and *Receive* perspectives work exactly as the perspectives described beforehand. Therefore, they are skipped in this tutorial for brevity. We refer to the sources listed in the README documentation of the github repository for a description why two rounds of communications are necessary.

### 2.1.20 Step 20

After finishing sending and receiving the second time, the *Result* perspective shows the sums for each variable (each sum is calculated with the data of all participants). This perspective will be the same for all participants. Click on *Export data* to export the data as a CSV or Microsoft Excel file.

EasySN	/IPC - Simple	Data Sharing With Secur	re Multi-Party Computi	ng			_		×
Action H	elp								
(1) S	itart	(2) Send	(3) Receive		(4) Send	(5) Receive		(6) Result	
			Resu	It data					
Study nam									
	orbidities								
Participan				1					
Full name:	Hospital 1			E-mail:	creator@hospit	al1.org			
Full name:	Hospital 2			E-mail:	participant@ho	spital2.org			
Full name:	Hospital 3			E-mail:	participant@ho	spital3.org			
Variables									
		ronic kidney disease, stag		Value:					
Variable:	G31.9 Deger	erative disease of nervou	is system, unspecified	Value:	7				
Variable:	G31 Circum	scribed brain atrophy		Value:	3				
Variable:	F32.x Depres	ssive episode		Value:	4				
Variable:	F33.x Recurr	ent depressive disorder		Value:	8				
			Even	ort data					

Figure 20: The *Result* perspective of EasySMPC.

## 2.2 Automated mode

### 2.2.1 Step 1

To create a new study, first start EasySMPC and click on *Create connection*.



Figure 21: Entry perspective of EasySMPC.

### 2.2.2 Step 2

The configuration dialog appears. Select the connection type (in the displayed case: e-mail). Then select either an existing configuration in the left menu or create a new connection.

To create a new connection, enter the e-mail address, your password and the names and ports of the receiving (IMAP) and sending (SMTP) server (if you do not know this data please ask your administrator). After entering the data you can click on *Select*. The connection will be automatically checked. If the check is successful, the dialog will close automatically. If the check is not successful, a warning message will appear and you can alter your configuration in the e-mail dialog. You will not be able to store the connection if the check is not successful.



Remark: You can also switch to the advanced e-mail configuration dialog. The dialog offers the following additional configuration options:

- The definition of a separate e-mail address for sending. The e-mail address which will be shared with the other participants will always be the receiving one.
- The definition of user names for the e-mail boxes differing from the e-mail address (e.g. the user name is *name* and not <u>name@domain.org</u>)
- The authentication mechanisms supported by the e-mail boxes. For details, please refer to the property *mail.imap.auth.mechanisms* in the <u>Jakarta e-mail documentation</u>.



Remark: To use EasySMPC's own backend instead of e-mail, select the respective tab. You will need the URL of the backend as well as your user name and password.

(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Resu
		St	art		
🔶 E-mail c	onnection properties				×
Manual	E-mail EasySMPC ba	ackend			
	1@insutec.de Base s	ettings Further setting	js		
	v2@insutec.de v0@insutec.de	Sin	nple settings 🔵 Advanc	ed settings	
	Login		, , , ,	y-	
	E-mail	address: easysmpc.dev1	@insutec.de Password:		
	Receive	e	Send		
	_	imap.ionos.de	Server:	smtp.ionos.de	
	Port: 1		Port: 4		
	Encryp	tion:   SSL/TI  StartT		on:   SSL/TLS  StartTLS	
Ca	ancel	Add	Remove	Select	

Figure 22: Connection configuration dialog.

### 2.2.3 Step 3

The *Entry* perspective is displayed again. You see the selected connection in the status bar. From here, please follow step 3 and forth following in chapter 2.1.

🔷 Ea	sySMPC - Simpl	e Data Sharing With Secu	ire Multi-Party Computin	9		- 🗆 ×
Action	Help					
	(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
			St	art		
			Create co	nnection		
			Load			
			Create n	ew study		
			Participat	e in study		
				_		
				Co	nnection easysmpc.dev0(	Dinsutec.de set (E-mail)

Figure 23: Entry perspective of EasySMPC with an e-mail connection set.

### 2.2.4 Step 4

Enter the name of the study as well as the name and the e-mail addresses of the participants. Afterwards click on the button *Load variables and values from file*.



Remark: Red-bordered fields indicate that the content of a field is not correct and needs to be corrected. In this case, the name of the first variable needs to be provided.

EasySMPC - Simple	e Data Sharing With Secu	ire Multi-Party Computir	ng			>
Action Help						
(1) Start	(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Result
General data		Creat	e study			
Study name: PKU cor	norbidities					
Participants (add your	details in the first entry)					
Full name: Hospital 1			E-mail:	creator@hospit	al1.org	+ -
Full name: Hospital 2	2		E-mail:	participant@ho	spital2.org	+ -
Full name: Hospital 3	}		E-mail:	participant@ho	spital3.org	+ -
Variables (add your da Variable:	ita here)		Value:	0		* -
		Load variables a	nd values	from file		
		Remove u				
		Save an	d procee	d		
					Using	manual data exchan

Figure 24: Start perspective of EasySMPC filled out partly.

#### 2.2.5 Step 5

Select a Microsoft Excel or CSV file in the now opened file browser. Browse to the folder of your data, select it and click Open.

action Help			1	(	(
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		Creat	te studv		
General data	🔮 Open			×	
Study name: PKU com	-		~		
Participants (add your	d Suchen in:	PKU study	× 1	i + k ⊞ ⊞ -	
Full name: Hospital 1	data PK	U.csv			• •
Full name: Hospital 2					+ -
Full name: Hospital 3	-			-	+ -
and the second sec					
Variables (add your dat	ta				
	ta				
Variables (add your daf Variable:	ta Dateiname:	data PKU.csv			
		data PKU.csv All Files			
	Dateiname:				
	Dateiname:		OF	ren Cancel	
	Dateiname:		Op	ren Cancel	
	Dateiname:	All Files	Op nd values from file	en Cancel	
	Dateiname:	All Files Load variables a		en Cancel	

Figure 25: File browser of EasySMPC.

### 2.2.6 Step 6

The data now appears in the bottom section of EasySMPC. You can click on Save and proceed.

Remark: Loading of data from a file is not necessary. You can also add variables and values manually.



Remark: The study name, the participants' names and e-mail addresses as well as variable names will be shared with **all other** study participants. The data you entered in the *Value* fields is **secured** and **will not** be shared.

(1) St	tart (2) Send (3) Receive		(4) Send	(5) Receive	(6)	) Result	
		ate study					
General da							
	e: PKU comorbidities						
Participant	ts (add your details in the first entry)	_					
Full name:	Hospital 1	E-mail:	creator@hospit	al1.org		+	Ŀ
Full name:	name: Hospital 2 E-mail: participant@hospital2.org			+	Γ.		
			hereichereicher				L
	Hospital 3	=	participant@hc	spital3.org		+	÷
Full name:		=		ispital3.org		+	÷
Full name: Variables (a	Hospital 3	=	participant@hc	spital3.org		+	
Full name: Variables (a Variable:	Hospital 3 add your data here)	E-mail: Value:	participant@hc	spital3.org			
Full name: Variables (a Variable:	Hospital 3 add your data here) N.18.1-5 Chronic kidney disease, stage I-V	E-mail: Value:	participant@ho 3 5	spital3.org		•	
Full name: Variables (a Variable: 1 Variable: ( Variable: (	Hospital 3 add your data here) N.18.1-5 Chronic kidney disease, stage I-V G31.9 Degenerative disease of nervous system, unspecifie	E-mail: Value: Value:	participant@hc 3 5 1	spital3.org		+	
Full name: Variables (; Variable: 1 Variable: ( Variable: 1 Variable: 1	Hospital 3 add your data here) N.18.1-5 Chronic kidney disease, stage I-V G31.9 Degenerative disease of nervous system, unspecifie G31 Circumscribed brain atrophy	E-mail: Value: Value: Value:	participant@hc 3 5 1 2	spital3.org		•	
Full name: Variables (; Variable: 1 Variable: ( Variable: 1 Variable: 1	Hospital 3 add your data here) N.18.1-5 Chronic kidney disease, stage I-V G31.9 Degenerative disease of nervous system, unspecifie G31 Circumscribed brain atrophy F32.x Depressive episode	E-mail: Value: Value: Value: Value: Value: Value:	participant@hc 3 5 1 2 6	spital3.org			

Figure 26: Start perspective of EasySMPC filled out completely.

### 2.2.7 Step 7

After clicking on *Save and proceed* a file browser opens to choose a location of your project file generated by EasySMPC. The file will store all relevant information necessary for your study. EasySMPC allows closing a file, stopping the processing and re-opening at a later point in time (see section *Saving, closing and re-opening a* study file).

	Help					
(1)	Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
			Cre	ate study		
General o	data	Save			×	
Study nar	me: PKU come					
Participa	nts (add your d	Speichern in:	PKU study	× 1	****	
Full name	e: Hospital 1					+ -
Full name	e: Hospital 2					+ -
					-	
i un nario	e: Hospital 3					
Variables	e: Hospital 3 (add your data N.18.1-5 Chro					+ -
Variables Variable:	(add your data N.18.1-5 Chro	Dateiname:	PKU_project_file			
Variables Variable: Variable:	(add your data N.18.1-5 Chro G31.9 Degene	Dateiname: Dateityp:	PKU_project_file SMPC Study			•
Variables Variable: Variable: Variable: Variable:	(add your data N.18.1-5 Chro G31.9 Degene G31 Circumsc		Contraction of the second seco			
Variables Variable: Variable: Variable: Variable:	(add your data N.18.1-5 Chro G31.9 Degene		Contraction of the second seco	Sa	ive Cancel	+ -
Variables Variable: Variable: Variable: Variable:	(add your data N.18.1-5 Chro G31.9 Degene G31 Circumsc	Dateityp:	SMPC Study	Value: 6	ve Cancel	+ - + -
Variables Variable: Variable: Variable: Variable:	(add your data N.18.1-5 Chro G31.9 Degene G31 Circumsc F32.x Depress	Dateityp:	SMPC Study		ve Cancel	+ - + - + -
Variables Variable: Variable: Variable: Variable:	(add your data N.18.1-5 Chro G31.9 Degene G31 Circumsc F32.x Depress	Dateityp:	SMPC Study sorder Load variables	Value: 6	ve Cancel	+ - + - + -

Figure 27: Save the project file generated by EasySMPC.

### 2.2.8 Step 8

From here on, the two send and two receiving perspectives are automatically processed. No manual action is necessary at this point. If an error in sending or receiving occurs, a message is displayed and the connection configuration can be altered.

(1) St	art	(2) Send	(3) Receive	į.	(4) Send	(5) Receive	(6) Result	
25 (m. 27)			Recei	ive data				
General dat	ta e: PKU como							
Participant		orbidities						
	Hospital 1			E-mail:	easysmpc.dev	0@insutec.de		
- ull name:			E-mail: easysmpc.dev0@insutec.de			1		
				E-mail:	easysmpc.dev			
	Hospital 3				easysmpc.dev			
			Create connect	E-mail:	easysmpc.dev			

Figure 28: The receiving perspective checking for messages.

#### 2.2.9 Step 9

After finishing sending and receiving the second time, the *Result* perspective shows the sums for each variable (each sum is calculated with the data of all participants). This perspective will be the same for all participants. Click on *Export data* to export the data as a CSV or Microsoft Excel file.

EasySM	MPC - Simpl	e Data Sharing With Secu	re Multi-Party Computi	ng			—		$\times$
Action H	lelp					-			
(1) 9	Start	(2) Send	(3) Receive		(4) Send	(5) Receive		(6) Result	
			Resu	ult data					
Study name: PKU comorbidities									
Participar									
	Hospital 1	1		E-mail:	creator@hospit	allorg			
	Hospital 2				participant@hc				-
	Hospital 3			-	participant@hc				-
i un narrie	a riospitar.	,		L-man.	participant@ne	spitalstorg			_
				_					
Variables				(					
Variable:	N.18.1-5 Ch	ronic kidney disease, sta	ge I-V	Value:	5				
Variable:	G31.9 Dege	nerative disease of nervo	us system, unspecified	Value:	7				
Variable:	G31 Circum	scribed brain atrophy		Value:	3				
Variable:	F32.x Depre	ssive episode		Value:	4				
Variable:	F33.x Recur	rent depressive disorder		Value:	8				
			5						
			Expr	ort data					_
L			- units						

Figure 29: The Result perspective of EasySMPC.

# 3 Participant

### 3.1 Manual mode

### 3.1.1 Step 1

The first step as a participant in manual mode is to receive an e-mail by the creator (see step 5 an example). Once you received the e-mail, you can start EasySMPC and click on *Create connection*.

EasySMPC - Simpl	e Data Sharing With Secu	re Multi-Party Computing			- 🗆 X
Action Help					
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		Sta	rt		-1
		Create cor	nnection		
		Load s			
		Create ne	w study		
		Participate	in study		

Figure 30: Entry perspective of EasySMPC.

### 3.1.2 Step 2

Click on Select. For the manual mode no other configuration is necessary.

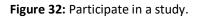
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		Sta	art		
	E-mail connection	n properties		×	
	Manual E-mail	EasySMPC backend			
		You will exchange strings by	v means of your choice	(e.g. e-mail chat program	).
	Manual data exchange.	rou win exchange strings b	y means or your choice	(e.g. e mail chat program	,.
					N
	Cancel	Add	Pomous	Calact	
	Cancel	Add	Remove	Select	
	Cancel	Add	Remove	Select	K
	Cancel	Add	Remove	Select	

Figure 31: Connection selection.

# 3.1.3 Step 3

Click on Participate in study.

🔷 Eas	🔮 EasySMPC - Simple Data Sharing With Secure Multi-Party Computing 🦳 🗆 🗙								
Action	Help								
(	1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result			
			St	art					
				nnection					
			Load	study					
			Create n	ew study					
			Participat						
					Set	t manual data exchange			
					Set	t manual data exchange			



### 3.1.4 Step 4

A dialog to enter the initial data you received will appear.

🐻 EasySMPC - Simple	Data Sharing With Secu	re Multi-Party Computin	g		- 🗆 🗙
Action Help			1		1
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
ie die die die die die die die die die d		S	tart		
	🍺 Enter data	received		×	
		Please enter the	data you received		
		C 1			
		Cancel	Ok		

Figure 33: Dialog to enter initially received data into EasySMPC.

### 3.1.5 Step 5

Open your e-mail program, highlight the entire text you received and copy it into the clipboard.

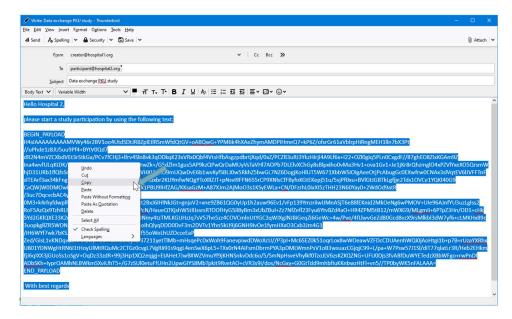


Figure 34: Initially received e-mail displayed in Mozilla Thunderbird.

### 3.1.6 Step 6

Return to EasySMPC, click into the red-bordered field and click on *Paste*. Proceed by clicking on the now activated *Ok* button.

🚡 EasySMPC - Simple Data Sharing With Secure Multi-Party Computing 🧧 🗆 🗙									
Action Help									
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result				
		St	art						
		Enter data received Please enter th Paste Ctrl-V Cancel	e dat a received	×					

Figure 35: Copy initial data into EasySMPC.

### 3.1.7 Step 7

Now the *Start* perspective appears showing all participants, e-mail addresses and variables. You cannot change this data. The sole thing you are entitled to enter are your values for the different variables. These values are **secured** and **will not** be shared. You can either enter your values manually or load your data from a file (see steps 5 and 6 in section *Manual mode* of the creator). EasySMPC will try to match the variable name in your provided file with the one displayed in EasySMPC and enter the specified data automatically. After entering your values, you can proceed by clicking on *Save and proceed*.

EasySN	MPC - Simple Data Sharing With Sec	ure Multi-Party Computir	ng			- 0	į.	$\times$	
Action H	Help		,						
(1) 5	Start (2) Send	(3) Receive		(4) Send	(5) Receive	(6) Re	sult		
Participate in study									
General data Study name: PKU comorbidities									
Participar	nts						_		
Full name	e: Hospital 1		E-mail:	creator@hospit	al1.org		+	-	
Full name	e: Hospital 2		E-mail:	participant@ho	spital2.org		+	•	
Full name	e: Hospital 3		E-mail:	participant@ho	spital3.org		+	-	
Variables							_		
Variable:	N.18.1-5 Chronic kidney disease, sta	age I-V	Value:	2			+	Ŀ	
Variable:	G31.9 Degenerative disease of nervo	ous system, unspecified	Value:	0			+	-	
Variable:	G31 Circumscribed brain atrophy		Value:	1			+	-	
Variable:	F32.x Depressive episode		Value:	1			+	-	
Variable:	F33.x Recurrent depressive disorder		Value:	0			+	•	
		Load variables a		-					
		Save an	d procee		Urin	g manual data	en ek		
					1 Using	g manuar uata	- A CH	ang	

Figure 36: The *Start* perspective of EasySMPC for a participant after loading data.

#### 3.1.8 Step 8

From here, please follow step 8 and forth following in chapter 2.1.

### 3.2 Automated mode

#### 3.2.1 Step 1

To participate in a study, the study creator must first create it. Once this is done, you can start EasySMPC and click on *Create connection*.

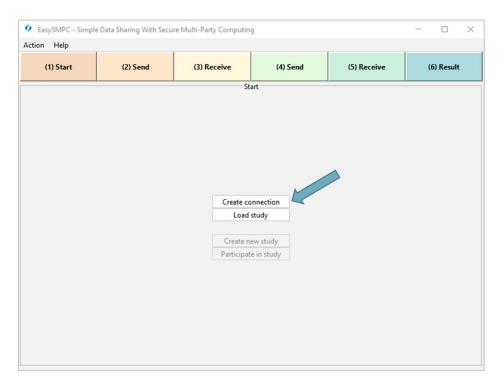


Figure 37: Entry perspective of EasySMPC.

#### 3.2.2 Step 2

The configuration dialog appears. Select the connection type (in the displayed case: e-mail). Then select either an existing configuration in the left menu or create a new connection.

To create a new connection, enter the e-mail address, your password and the names and ports of the receiving (IMAP) and sending (SMTP) server (if you do not know this data please ask your administrator). After entering the data you can click on *Select*. The connection will be automatically checked. If the check is successful, the dialog will close automatically. If the check is not successful, a warning message will appear and you can alter your configuration in the e-mail dialog. You will not be able to store the connection if the check is not successful.



Remark: You can also switch to the advanced e-mail configuration dialog. The dialog offers the following additional configuration options:

- The definition of a separate e-mail address for sending. The e-mail address which will be shared with the other participants will always be the receiving one.
- The definition of user names for the e-mail boxes differing from the e-mail address (e.g. the user name is *name* and not <u>name@domain.org</u>)
- The authentication mechanisms supported by the e-mail boxes. For details, please refer to the property *mail.imap.auth.mechanisms* in the <u>Jakarta e-mail documentation</u>.



Remark: To use EasySMPC's own backend instead of e-mail, select the respective tab. You will need the URL of the backend as well as user name and password.

1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Resu
		St	tart		
🔮 E-mail co	onnection properties				×
Manual	E-mail EasySMPC ba	ckend			
	1@insutec.de Base s	ettings Further setting	gs		
	/2@insutec.de /0@insutec.de	Sin	nple settings 🔵 Advance	ed settings	
	Login		,	y-	
	E-mail	address: easysmpc.dev1	@insutec.de Password:		
	Receive	2	Send		
	Server:	imap.ionos.de	Server:	smtp.ionos.de	
	Port: 9		Port: 46		
	Encrypt	tion:   SSL/T  StartT		on:   SSL/TLS  StartTL	
Ca	incel	Add	Remove	Select	

Figure 38: Connection configuration dialog.

### 3.2.3 Step 3

The *Entry* perspective is displayed again showing the selected connection in the status bar. Please click on *Participate in study*.

🔷 Easy	SMPC - Simple	Data Sharing With Secu	re Multi-Party Computin	1		- 🗆 🗙
Action	Help					
(1	) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
			St	art		
			Create co Load			
			Load	audy		
			Create n	ew study		
			Participat			
				Co	nnection easysmpc.dev0(	@insutec.de set (E-mail)

Figure 39: Entry perspective of EasySMPC with an e-mail connection set.

### 3.2.4 Step 4

Please select the study you want to participate in and click on OK to proceed.

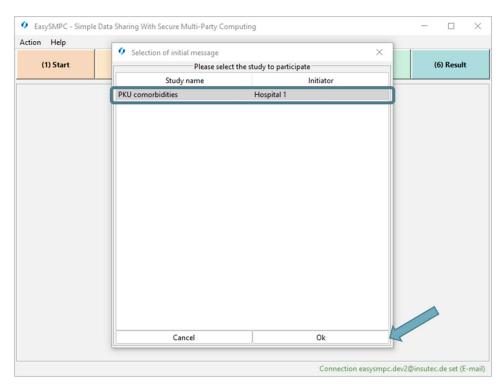


Figure 40: Select study to participate.

### 3.2.5 Step 5

Now the *Start* perspective appears showing all participants, e-mail addresses and variables. You cannot change this data. The sole thing you are entitled to enter are your values for the different variables. These values are **secured** and **will not** be shared. You can either enter your values manually or load your data from a file (see steps 5 and 6 in section *Manual mode* of the creator). EasySMPC will try to match the variable name in your provided file with the one displayed in EasySMPC and enter the specified data automatically. After entering your values, you can proceed by clicking on *Save and proceed*.

EasySI	MPC - Simple	Data Sharing With Secur	re Multi-Party Computi	ng			-		×
Action H	Help	,					(		
(1) 5	Start	(2) Send	(3) Receive		(4) Send	(5) Receive	(6) F	Result	
0			Participa	te in stud	iy		-		
General d	lata ne: PKU com	orbidities							_
Participar		londialació							
	e: Hospital 1			E-mail:	creator@hospit	al1.org		+	
Full name	Hospital 2			E-mail:	participant@ho	ospital2.org		+	Ă
Full name	e: Hospital 3			E-mail:	participant@ho	ospital3.org		+	Ē
Variables									
Variable:	N.18.1-5 Chr	onic kidney disease, stag	je I-V	Value:	2			+	-
Variable:	G31.9 Degen	erative disease of nervou	is system, unspecified	Value:	0			+	-
Variable:	G31 Circums	scribed brain atrophy		Value:	1			+	•
Variable:	F32.x Depres	sive episode		Value:	1			+	ŀ
Variable:	F33.x Recurr	ent depressive disorder		Value:	0			+	·
			Load variables a	nd values	from file				
			Save an	d procee	d				
						Usin	g manual dat	a exch	ange

Figure 41: The *Start* perspective of EasySMPC for a participant after loading data.

### 3.2.6 Step 6

From here on, the two send and two receiving perspectives are automatically processed. No manual action is necessary at this point. If an error in sending or receiving occurs, a message is displayed and the connection configuration can be altered.

(1) St	tart	(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Result
			Receiv	ve data			
General dat							
0 5055 10	PKU com	orbidities					
articipant				e		0.00:	
	e: Hospital 1 E-mail: easysmpc.dev0@insutec.de e: Hospital 2 E-mail: easysmpc.dev1@insutec.de						
ull name:	Hospital				il: easysmpc.dev1@insutec.de		
	Hospital 3				easysmpc.dev		
anan							
anan			Create connecti Manually ente	E-mail:	easysmpc.dev		

Figure 42: The receiving perspective checking for messages.

#### 3.2.7 Step 7

After finishing sending and receiving the second time, the *Result* perspective shows the sums for each variable (each sum is calculated with the data of all participants). This perspective will be the same for all participants. Click on *Export data* to export the data as a CSV or Microsoft Excel file.

EasySN	APC - Simple	e Data Sharing With Secu	re Multi-Party Computi	ng			-		$\times$
Action H	lelp								
(1) 5	Start	(2) Send	(3) Receive		(4) Send	(5) Receive		(6) Result	
			Resu	ult data					
Study nan	ne: norbidities								
Participan	Hospital 1			E-mails	creator@hospit	all org			
									_
	Hospital 2			-	participant@hc				
Full name	: Hospital 3	3		E-mail:	participant@ho	ospital3.org			
Variables									
Variable:	N.18.1-5 Ch	ronic kidney disease, sta	ae I-V	Value:	5				
-		nerative disease of nervo	-	Value:					=
	-	scribed brain atrophy	, , ,	Value:					
		ssive episode		Value:					=
Variable:	F33.x Recur	rent depressive disorder		Value:	8				
				C					
			Expo	ort data					

# 4 Saving, closing and re-opening a study file

EasySMPC supports to save the current state to the study file to proceed at a later point in time for all *Send* and *Receive* perspectives. The steps necessary are described below.

### 4.1.1 Step 1

While working with an EasySMPC study, click on *Action* and then on *Save study interim state*. The study is saved to the project file.

EasySM Action He	PC - Simple Data Sharing With Secure	Multi-Party Computing				-		×
<ul> <li>Create co</li> <li>Load stu</li> </ul>	onnection 2) Se	(3) Receive		(4) Send	(5) Receive		(6) Resul	t
🔮 Exit	dy interim status	Send your	data					
Participant								
Full name:	Hospital 1	E-I	mail:	creator@hospit	al1.org	Send e	-mail	~
Full name:	Hospital 2	E-r	mail:	participant@ho	spital2.org	Send e	-mail	~
Full name:	Hospital 3	E-r	mail:	participant@ho	spital3.org	Send e	-mail	~
		Manually send all per	ndina	merrager				
		Procee		messages				

Figure 44: Saving the current state of an open study.

### 4.1.2 Step 2

Now click on *Action* and *Exit* or the red X in the upper right corner. The subsequent dialog can be confirmed with *Yes*.

EasySM Action He		Sharing With Secur	re Multi-Party Comput	ing				×
(1) St		(2) Send	(3) Receive	6	(4) Send	(5) Receive	(6) Result	t
			Send	your data				
General dat								
tudy name	PKU comorbio	lities						
Participant	5							
Full name:	Hospital 1			E-mail:	creator@hospita	al1.org	Send e-mail	~
Full name:	Hospital 2			E-mail:	participant@hos	spital2.org	Send e-mail	~
Full name:	Hospital 3	0	Exit program?		×	al3.org	Send e-mail	1
				Yes	No			
			Manually send a					
			ivianually send a	all pending	messages			

Figure 45: Confirm closing EasySMPC.

# 4.1.3 Step 3

To reload the file, click on *Load study* after starting EasySMPC.

🔷 Easy	SMPC - Simple	e Data Sharing With Secu	re Multi-Party Computing	r.		-		$\times$
Action	Help							
(1	) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(	6) Result	t
			Sta	rt				
			Create con	nection				
			Load s					
			Create ne	w study				
			Participate	in study				

#### Figure 46: Start loading a study in EasySMPC.

### 4.1.4 Step 4

Select the study file in the now opened file browser and click Open.

Action Help		[			
(1) Start	(2) Send	(3) Receive	(4) Send	(5) Receive	(6) Result
		St	tart		
	open 🚺			×	
	Suchen in:	PKU study	× 1	* IS 🗄 🗄	
	Dateiname: F	ct_file.smpc PKU_project_file.smpc SMPC Study	Ор	en Cancel	

Figure 47: Dialog to select the study file.

### 4.1.5 Step 5

Now you can proceed working with EasySMPC.

		1		Í.	1	
(2) Send	(3) Receive		(4) Send	(5) Receive	(6) Result	t
	Send	your data				
arbidition						
indicites						
		E-mail:	creator@hospi	tal1.org	Send e-mail	1
		E-mail:	participant@ho	ospital2.org	Send e-mail	4
		E-mail:	participant@ho	ospital3.org	Send e-mail	4
•	orbidities	Send	orbidities E-mail: E-mail:	Send your data orbidities E-mail: creator@hospi E-mail: participant@ho	Send your data	orbidities E-maik creator@hospital1.org Send e-mail E-maik participant@hospital2.org Send e-mail

Figure 48: EasSMPC opened the study in the recent state.