

The Risk Assessment Knowledge Integration Platform (RAKIP) Initiative and it's solutions

29.05.2024, Berlin

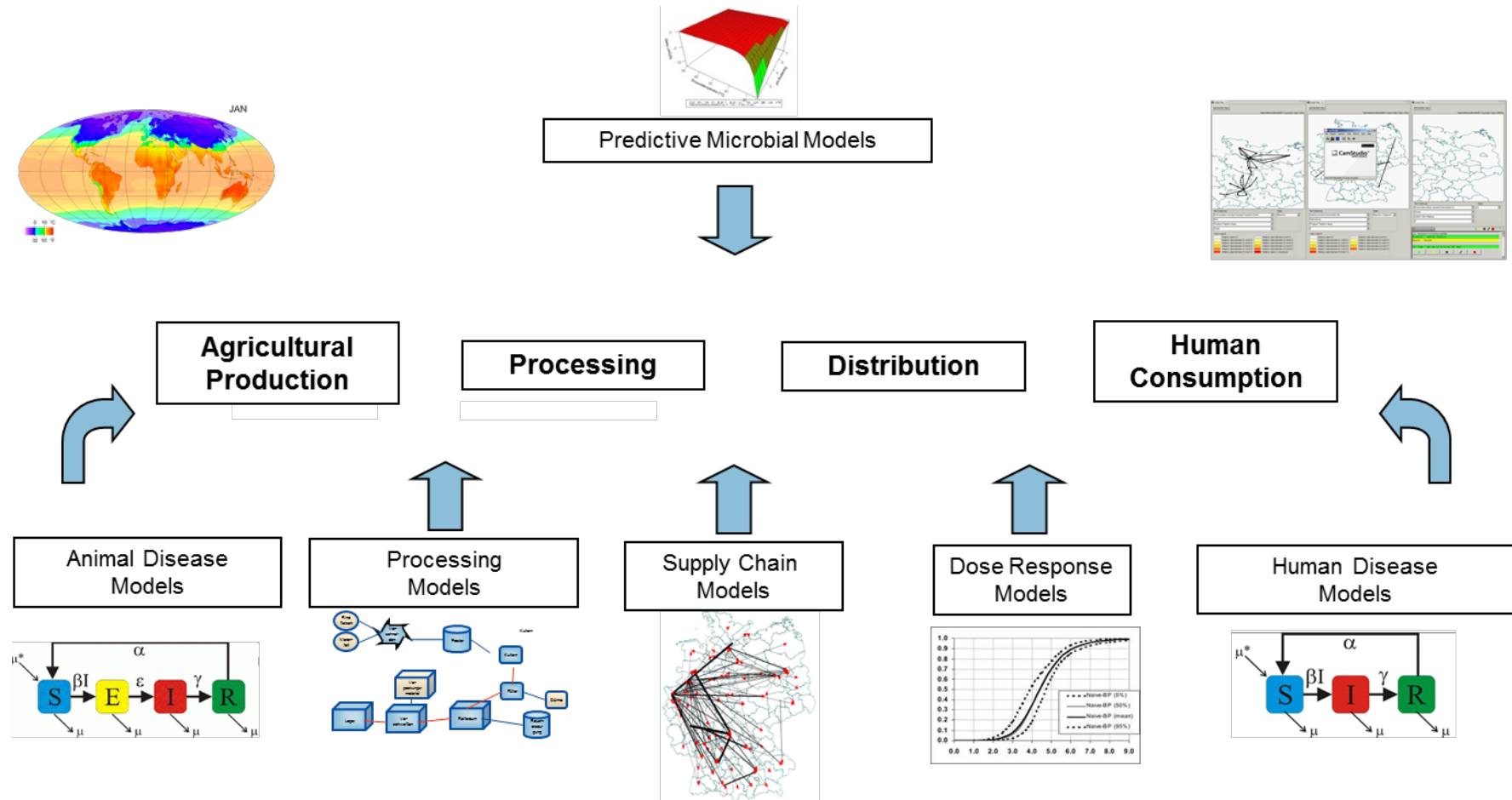
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Department Biological Safety



RAKIP Initiative
risk assessment knowledge integration platform

Risk Assessments in the Digital Age



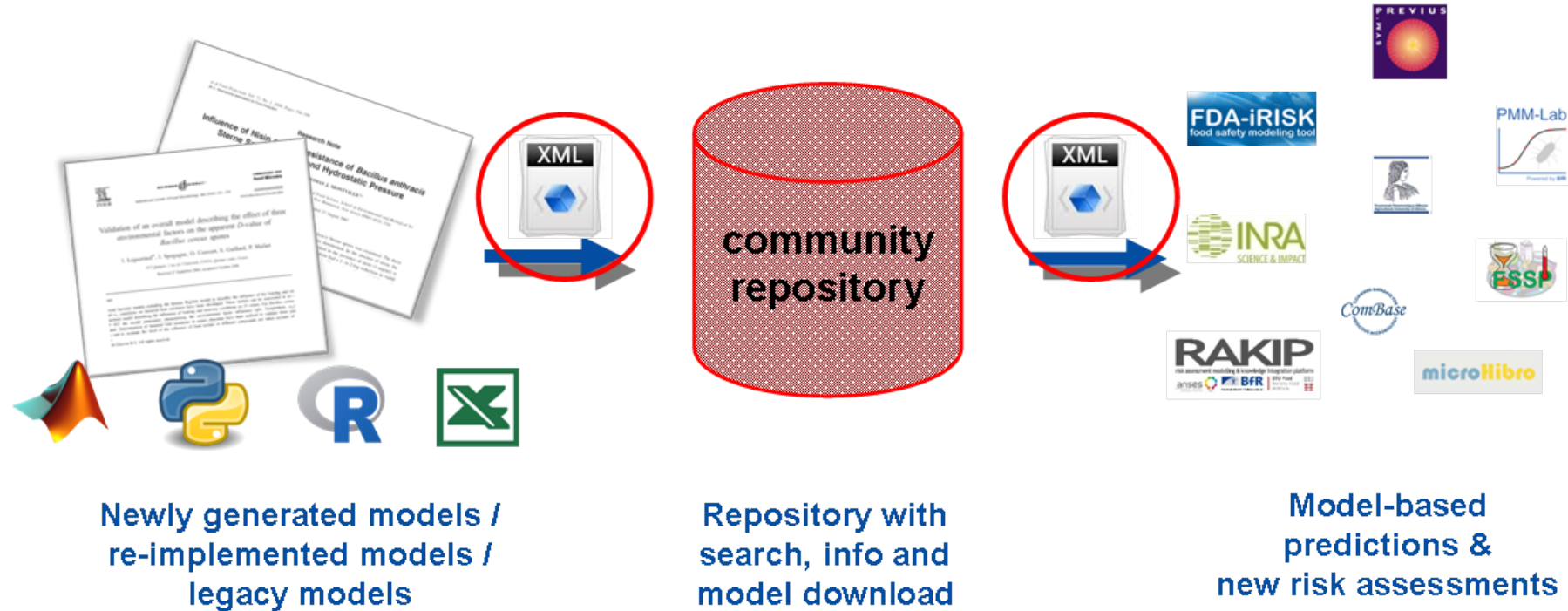
Sharing Predictive Models -> Current Practices in Food Safety



- => Often difficult to get “raw models” to run
- => No way to combine models
- => No information exchange between existing tools
- => No way to automate KnowledgeBase population
- => No bridge from research to application

RAKIP Initiative Vision

Community-driven, curated
repository of food safety models / model modules
(Food Safety Knowledge Base)



RAKIP History

- September 2015 a discussion at the ICPMF9 conference
- October 2016 a proposal for a tri-lateral funded collaboration project between ANSES, DTU, BfR
- January 2017 start of RAKIP project
- Summer 2020 start of RAKIP Initiative
- Currently RAKIP Initiative supported by 12 European agencies / universities

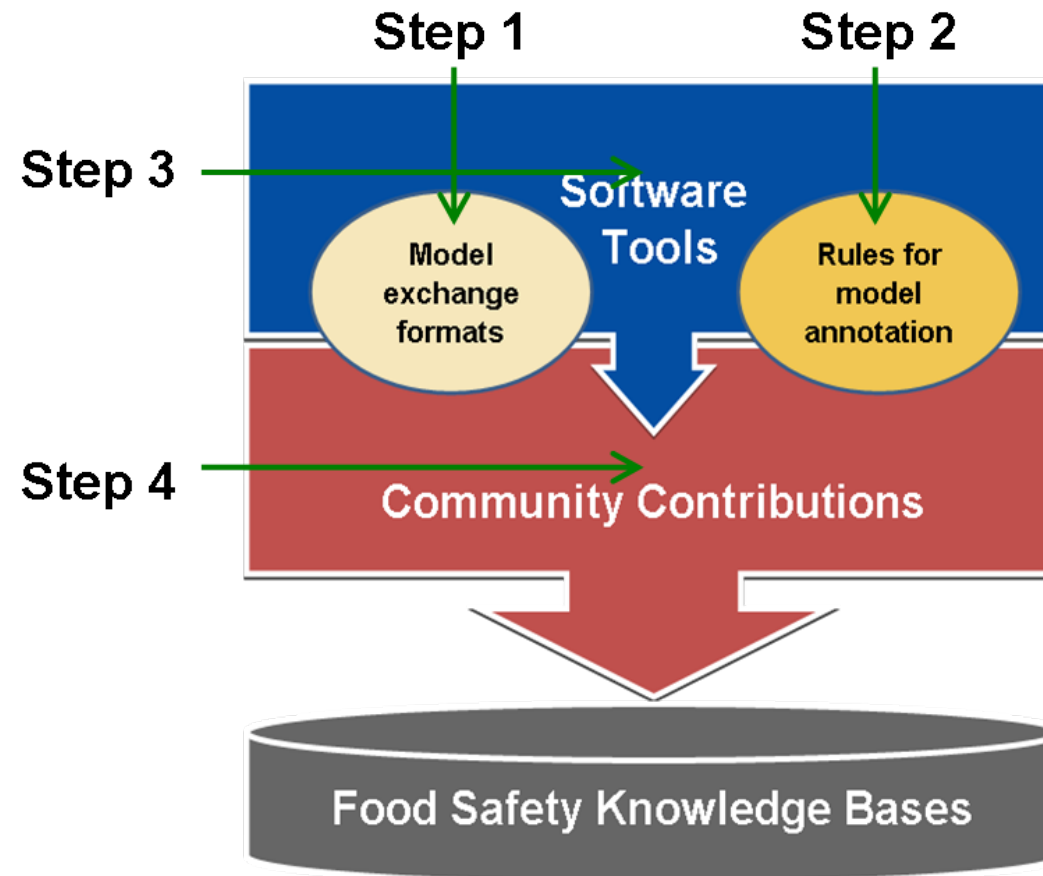
Funding:

From member organizations

International project funds: AGINFRA+, One Health EJP, MediFit, EFSA-FPA,

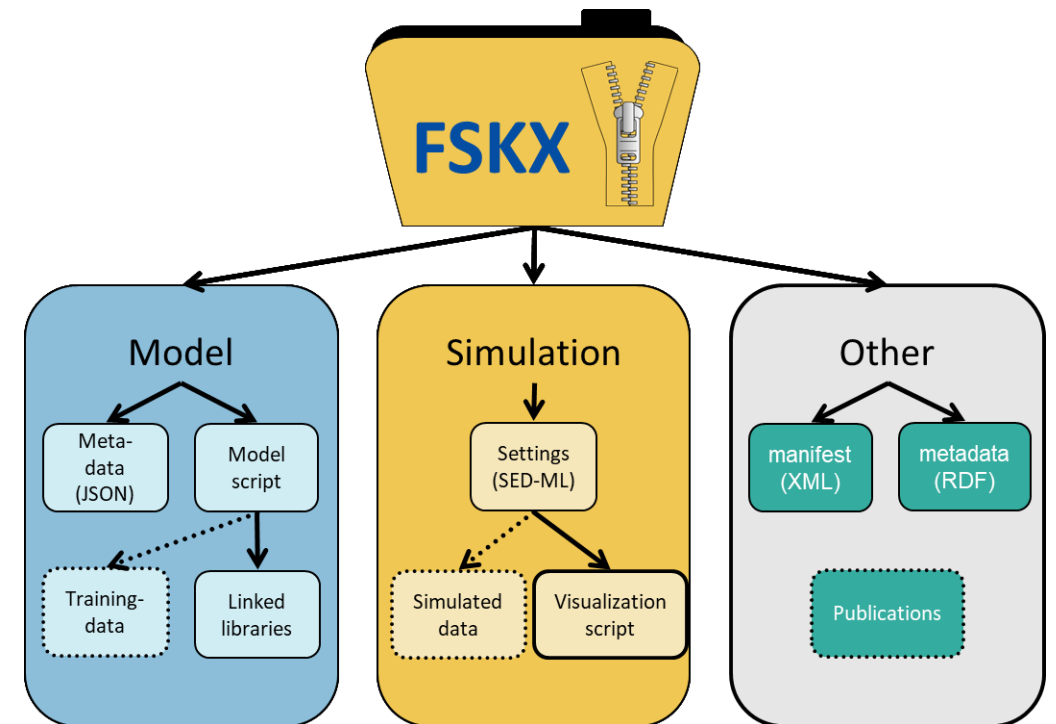
National funds: FoodDecide, KIDA, EFSA focal points tailor-made tasks

RAKIP Initiative Strategy



Core Achievement: FAIR Scientific Knowledge eXchange Format (FSKX)

- A harmonized format for knowledge exchange
- Encodes all relevant data / models in a machine-readable format
- Supports:
 - model scripts in different scripting languages, e.g., R or Python
 - provisioning of data, simulation settings and supporting scripts (e.g. for result visualization)
 - metadata schema maintained by RAKIP
 - Linked Data paradigm



Core Achievement: Minimum Information Guideline (MIRARAM)



Food Research International

Volume 139, January 2021, 109952



Minimum Information Required to Annotate Food Safety Risk Assessment Models (MIRARAM)

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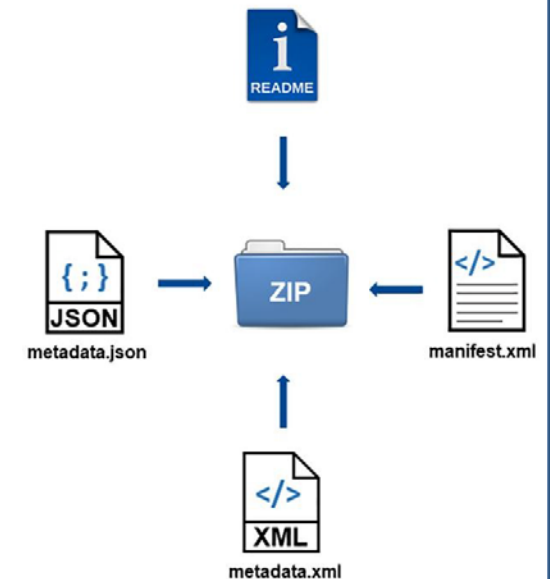
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MIRARAM GUIDELINE

METADATA REQUIREMENTS

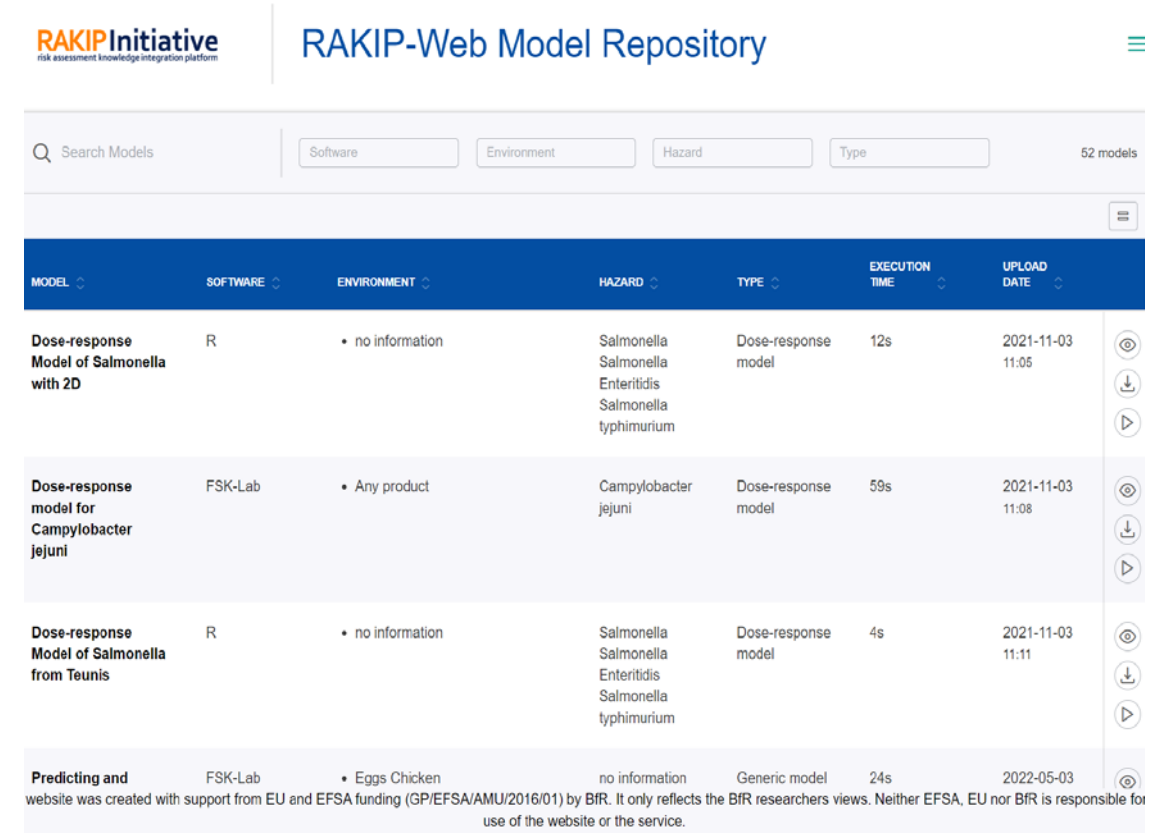
- Model name
- Model ID
- Model creator
- Creation date
- License
- Model execution
- Reference description
- Model scope
- For each model parameter:
 - Parameter ID
 - Parameter classification
 - Parameter unit
 - Parameter data type
 - Parameter default value

TECHNICAL RECOMMENDATIONS



FSKX Software Ecosystem

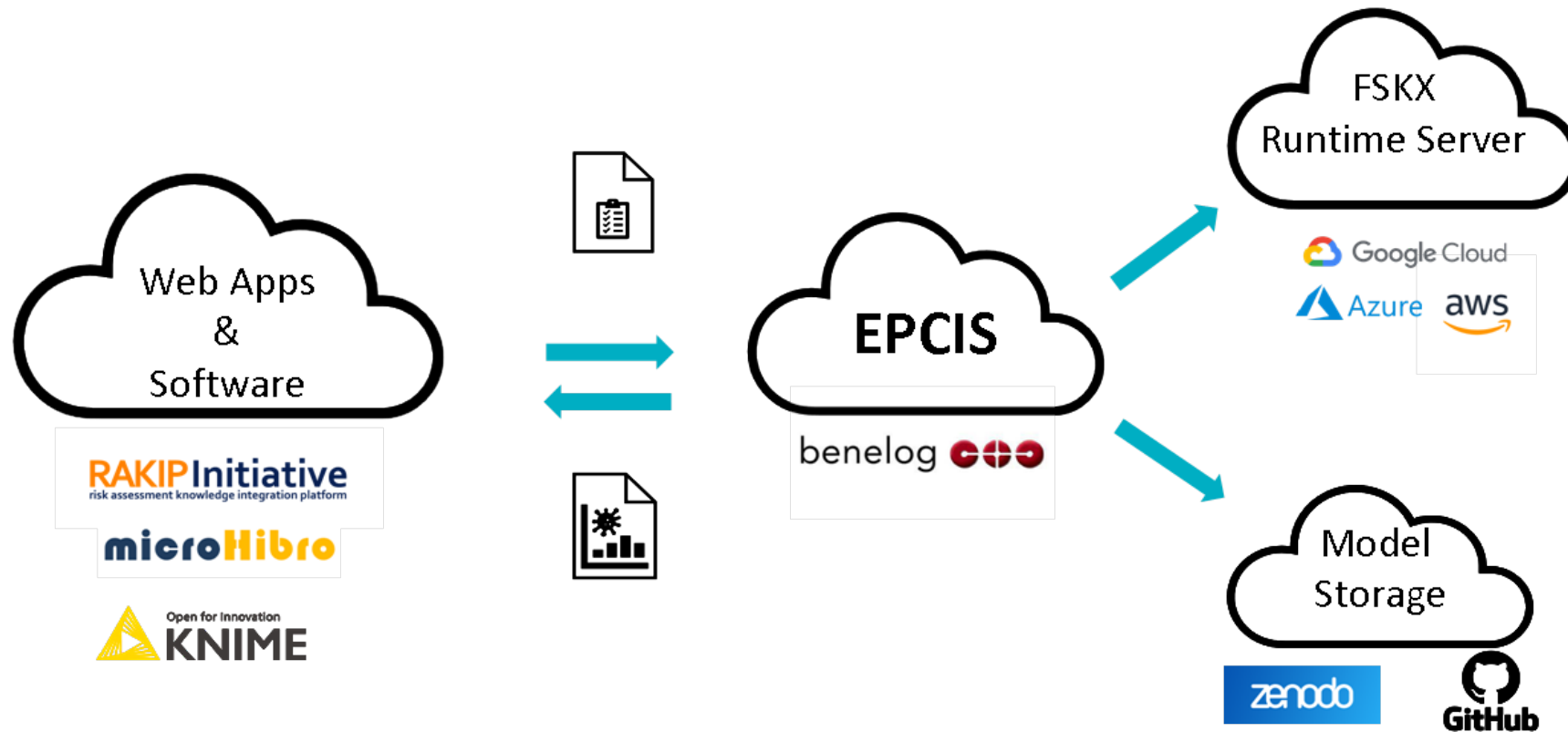
- **Online:**
 - RAKIP Web Model Repository
 - Knowledge Junction (Zenodo) Repository
 - Virtual Research Environment Repository
 - FSKX Model Creation service
 - FSKX Model Execution service
 - FSKX Model Joining service
 - Zenodo Upload service
 - 3rd party tools support (MicroHibro, FESMJ)
- **Desktop software (open source):**
 - FSK-Lab
 - R
 - “Helper libraries” (for software developers)



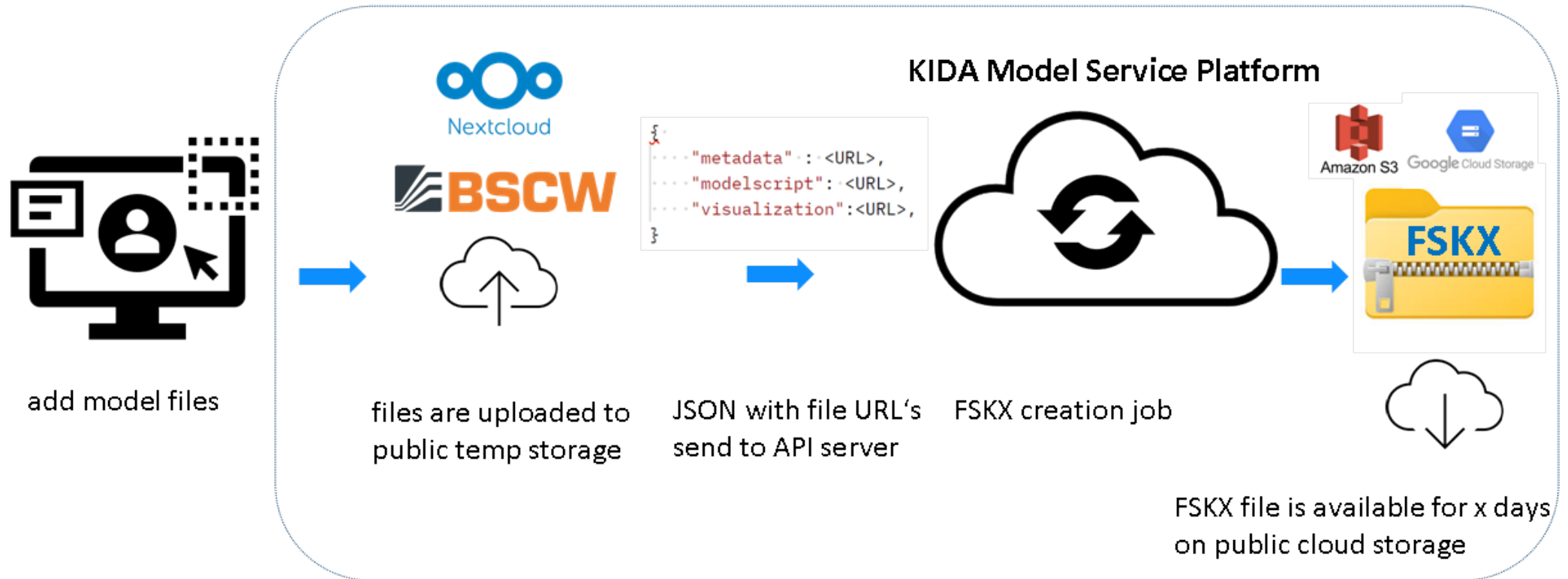
The screenshot shows the RAKIP-Web Model Repository interface. It features a search bar and filters for Software, Environment, Hazard, and Type. Below the search bar is a table listing models. The table has columns for Model, Software, Environment, Hazard, Type, Execution Time, and Upload Date. The first row shows a 'Dose-response Model of Salmonella with 2D' model using R software, with no environment information, hazards of Salmonella, Salmonella, Enteritidis, and Salmonella typhimurium, a dose-response model type, 12s execution time, and an upload date of 2021-11-03 11:05. The second row shows a 'Dose-response model for Campylobacter jejuni' model using FSK-Lab software, with any product environment, Campylobacter jejuni hazard, dose-response model type, 59s execution time, and an upload date of 2021-11-03 11:08. The third row shows a 'Dose-response Model of Salmonella from Teunis' model using R software, with no environment information, Salmonella, Salmonella, Enteritidis, and Salmonella typhimurium hazards, dose-response model type, 4s execution time, and an upload date of 2021-11-03 11:11. The fourth row shows a 'Predicting and' model using FSK-Lab software, with eggs chicken environment, no information hazard, generic model type, 24s execution time, and an upload date of 2022-05-03. A footer note states: 'website was created with support from EU and EFSA funding (GP/EFSA/AMU/2016/01) by BfR. It only reflects the BfR researchers views. Neither EFSA, EU nor BfR is responsible for use of the website or the service.'

MODEL	SOFTWARE	ENVIRONMENT	HAZARD	TYPE	EXECUTION TIME	UPLOAD DATE
Dose-response Model of Salmonella with 2D	R	• no information	Salmonella Salmonella Enteritidis Salmonella typhimurium	Dose-response model	12s	2021-11-03 11:05
Dose-response model for Campylobacter jejuni	FSK-Lab	• Any product	Campylobacter jejuni	Dose-response model	59s	2021-11-03 11:08
Dose-response Model of Salmonella from Teunis	R	• no information	Salmonella Salmonella Enteritidis Salmonella typhimurium	Dose-response model	4s	2021-11-03 11:11
Predicting and	FSK-Lab	• Eggs Chicken	no information	Generic model	24s	2022-05-03

Current Work: Establishing a Cloud-based FSKX Execution Framework



Current Work: Establishing an AI-assisted FSKX Generation Service



Current Work: Demo-Applications to show the Power of FSKX and AI

- Online Chatbot, powered by generative AI, that can answer questions on available FSKX model files
- On user request, the chatbot finds a suitable FSKX model if it exists
- Chatbot triggers execution of agents to create a model-specific User Interface so user can enter his own input data for a simulation with the given model
- Chatbot triggers model execution with user-defined input in a secure cloud compute infrastructure
- Chatbot display simulation results and helps with interpretation

Chat with our BfR AI

Hi I'm an AI. How can I assist you?

"can you predict growth rates of Listeria in seafood and meat products?"

Listeria Modelling in Seafood & Meat Products

Storage temperature

NaCl concentration of food matrix

pH of food matrix

Concentration of smoke components (phenol) in food matrix

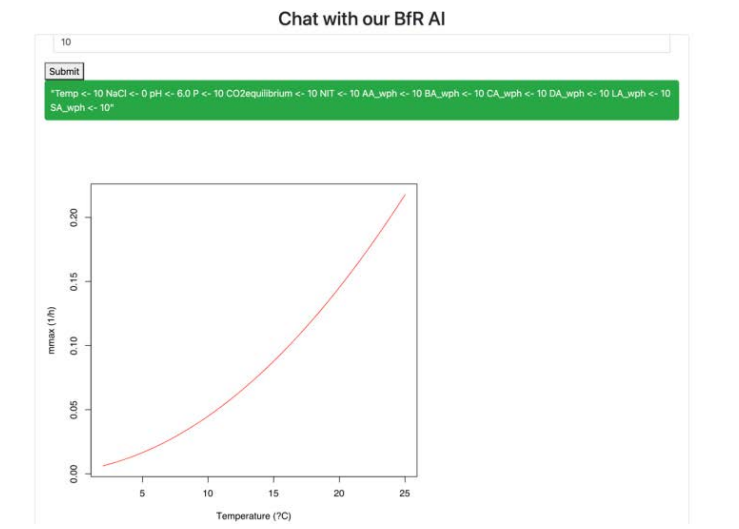
CO2 Equilibrium in food packaging

Nitrite concentration of food matrix

Acetic acid concentration of food matrix

Benzoic acid concentration of food matrix

Ask something...



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BfR | Risiken erkennen –
Gesundheit schützen


<https://foodrisklabs.bfr.bund.de/rakip-initiative/>

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