

# Workshop on System State Modelling and Toolbox Design

## Synthesis & Prototyping

23rd of October 2014, Brussels

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# Agenda “Synthesis & Prototyping” (WP 5)

## I. Objectives and Overview

## II. Challenges

## III. Components of Toolbox Development

## IV. Outlook

# WP5: Objectives (1/2)

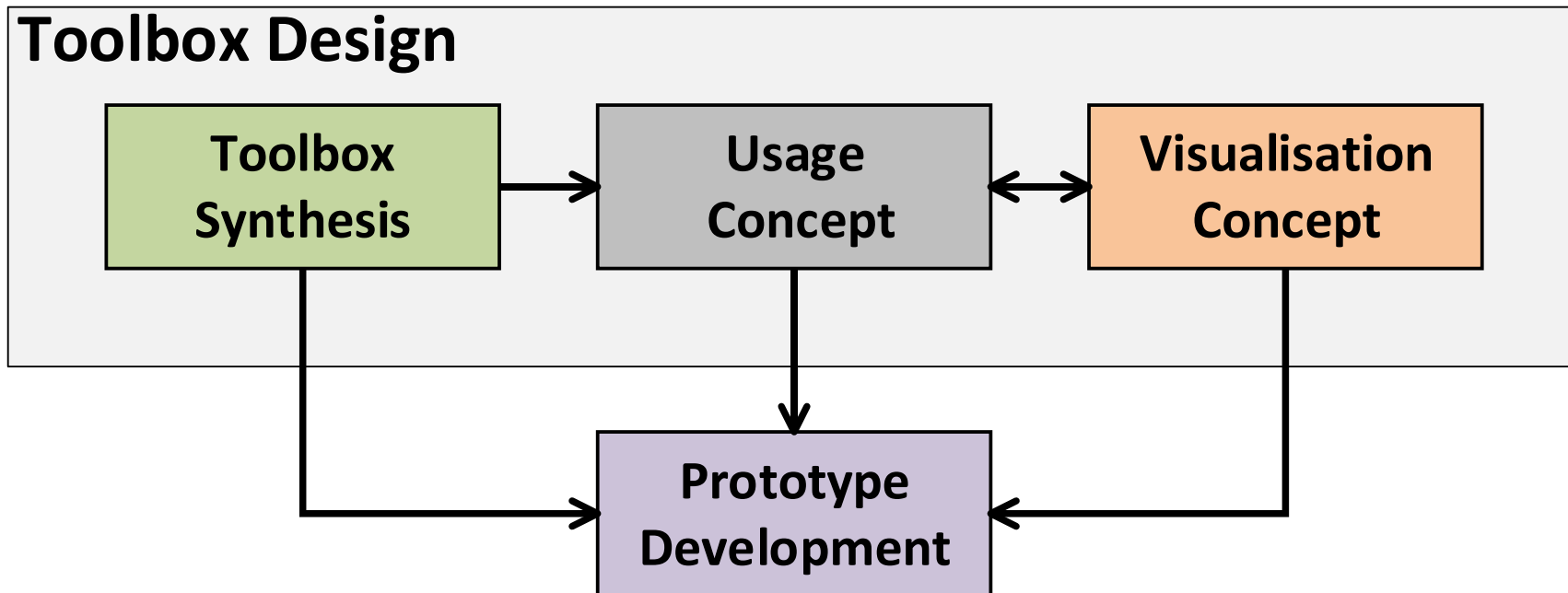
- **Toolbox Design**
  - Development of a specification for a toolbox comprising modules for forecasting, optimisation and risk-based security assessment
  - Development of a usage concept
  - Development of a visualisation concept
- **Prototype Development**
  - Proof-of-concept based on a prototype with the key features
  - Preliminary concept for link to existing TSO processes (DACF)
  - Include proposals for the visualisation of prototype results
    - Based on the concept developed in the framework of “Toolbox Design”
    - Options for software vendors realising a commercial version in the future

## WP5: Objectives (2/2)

- Development of an Integrated Toolbox
  - Synthesis of concepts developed for forecasting, optimisation and risk-based security assessment
  - Emphasis on those methods and concepts most appropriate and promising for usage in daily operation
  - Description of cooperation and interdependencies between concepts
- Usage and Visualisation Concept Main Parts of Toolbox Design
  - Description of the integration of the toolbox into existing platforms and processes (usage concept )
  - Appropriate method for the representation of huge amount of information provided by the toolbox (visualisation concept)
- Proof of Concept Based on Toolbox Prototype
  - Prototype includes key functionalities
  - Offline testing of complete toolbox based on testbook

# WP5: Overview (1/2)

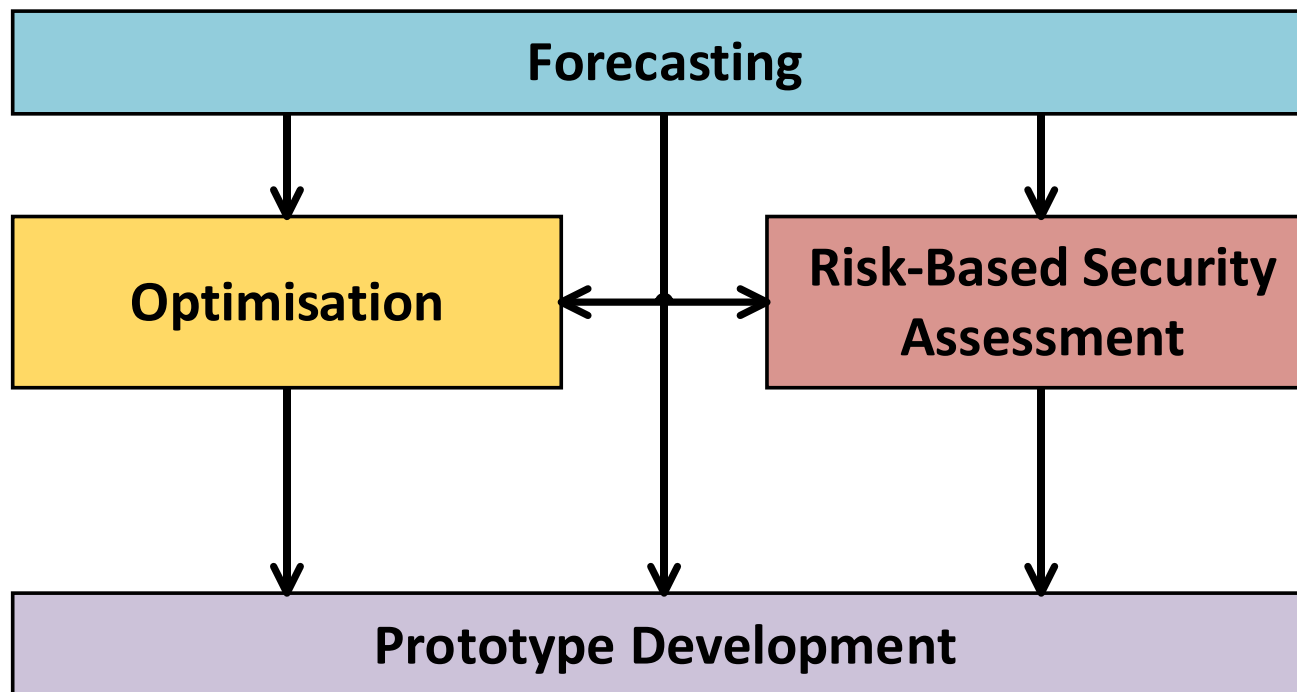
- Components of “Synthesis & Prototyping”:



- ➔ Prototype Development Based on Toolbox Design
- ➔ Final Step to Proof Concept by Applying Tests to Prototype

## WP5: Overview (2/2)

- Scheme of Information/Data Flows



→ Exchange of Information between Optimisation and Risk-Based Assessment Required

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# WP5: Challenges (1/2)

- Synthesis
  - Identification of TSO Requirements and Expectations
    - What do TSOs need in order to cope with challenges arising from a rapidly altering environment?
  - Alignment with Concepts Developed for Forecasting, Optimisation and Risk-Based Security Assessment
    - What does research propose to face TSO challenges?
  - Definition of Data Requirements and Interdependencies of Concepts
    - Which input data is required for modules developed as part of new concepts for forecasting, optimisation and risk-based security assessment?
    - How do these modules interact (data exchange etc.)?
    - What is the sequence of the different modules?
    - What is the computation required and does it fit to the time restrictions given by the process?



# WP5: Challenges (2/2)

- Usage Concept
  - How can the required data be accessed in different TSO environments?
  - What are the differences among TSOs in terms of data mining/handling and process setup/execution?
  - Can the results be integrated in the existing processes?
- Visualisation Concept
  - How to display probabilistic findings?
  - How to lead operators to these results and to gain their acceptance?
  - How can the scientific state-of-the-art visualisation concepts be aligned with best practice TSO concepts?
- Prototype Development
  - What is the most appropriate approach for the coordination of inputs and results?
  - How to reflect and consider different TSO “cultures”?

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# WP5: Synthesis (Objectives)

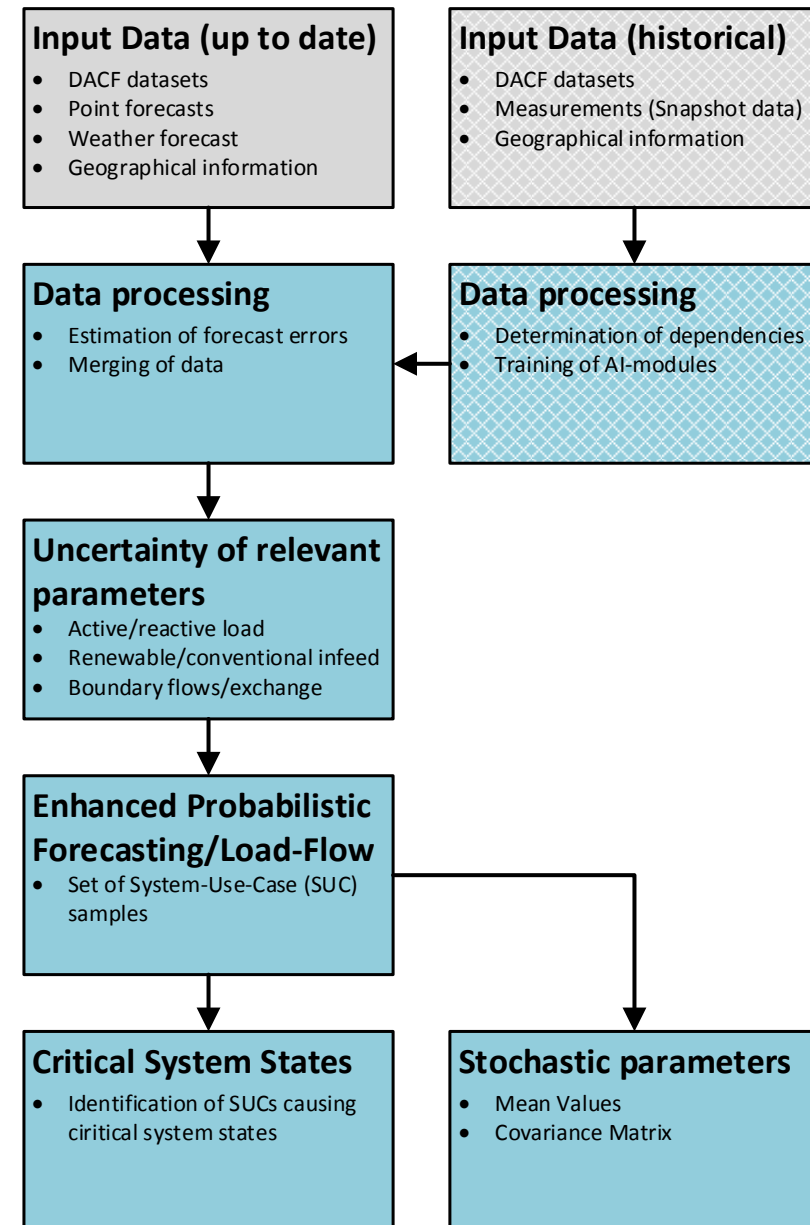
- Review of Concepts Developed for Forecasting, Optimisation and Risk-Based Security Assessment
  - Definition of modules and functionalities
- Inquiry on Requirements and Expectations by TSOs
  - Analysis of existing processes (DACF)
- Alignment of Concepts and Expectations
  - Selection of modules and functionalities to be included in toolbox
  - Identification of interface and data exchange between modules and functionalities
    - Focus on toolbox prototype
- Definition of Data Requirements
  - Distinction between required and currently available data

# WP5: Synthesis (Results)

- “Toolbox requirements” (Deliverable D5.1)
  - Requirements for network forecasting, system optimisation and risk-based security assessment
    - Description of preliminary concepts
    - Enquiry on TSO expectations and requirements
    - Alignment of modules/functionalities to be developed based on preliminary concepts and requirements
  - High level description of interfaces and –dependencies of modules
    - Focus on data exchange and potential sequence

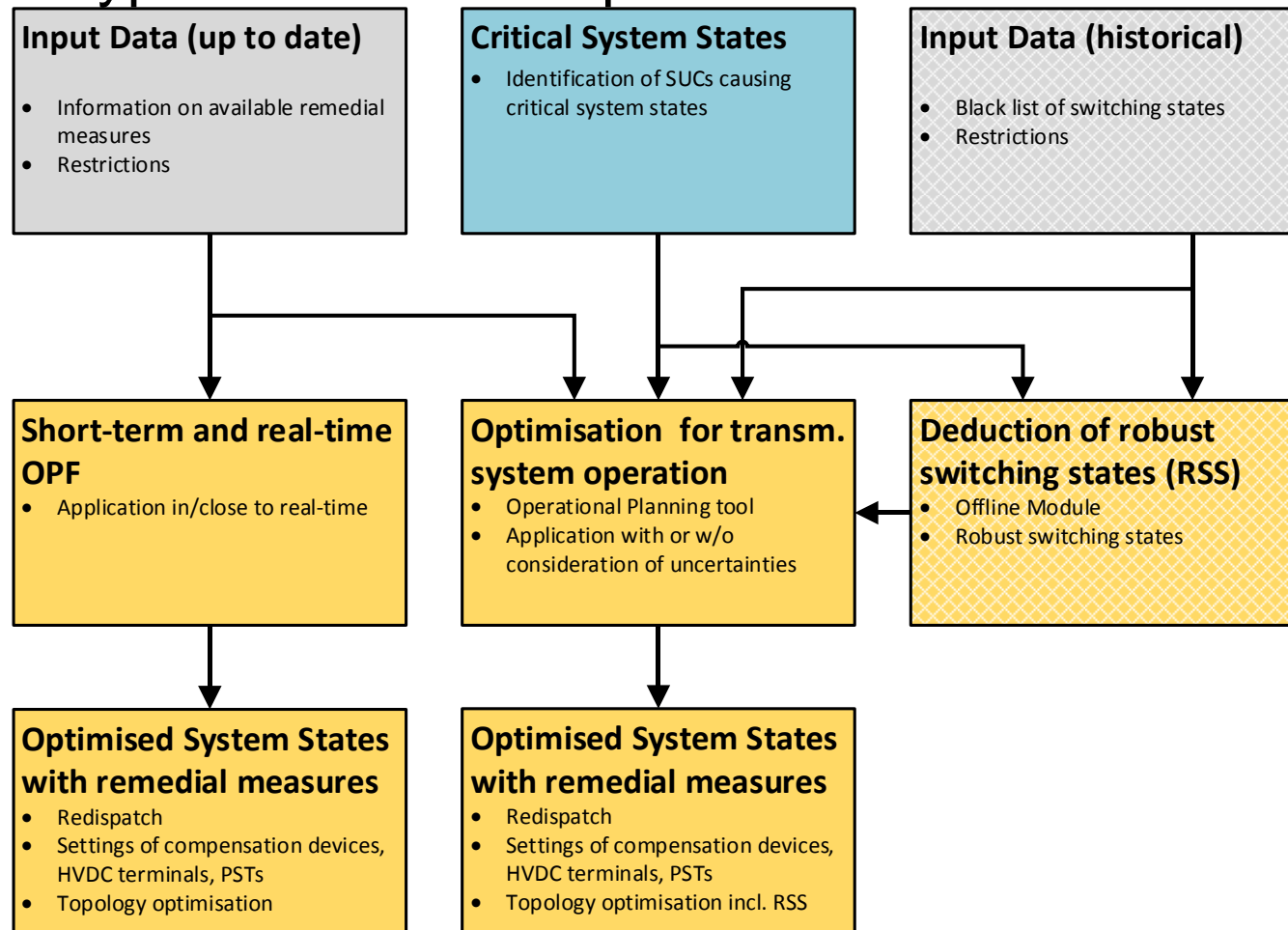
# WP5: Synthesis (1/5)

- Prototype Modules for Forecasting
  - Uncertainty of active and reactive load forecast
  - Uncertainty of active infeed forecast
  - Forecast of critical system states
- Mining and Processing of Historical Data to be Done Off-Line



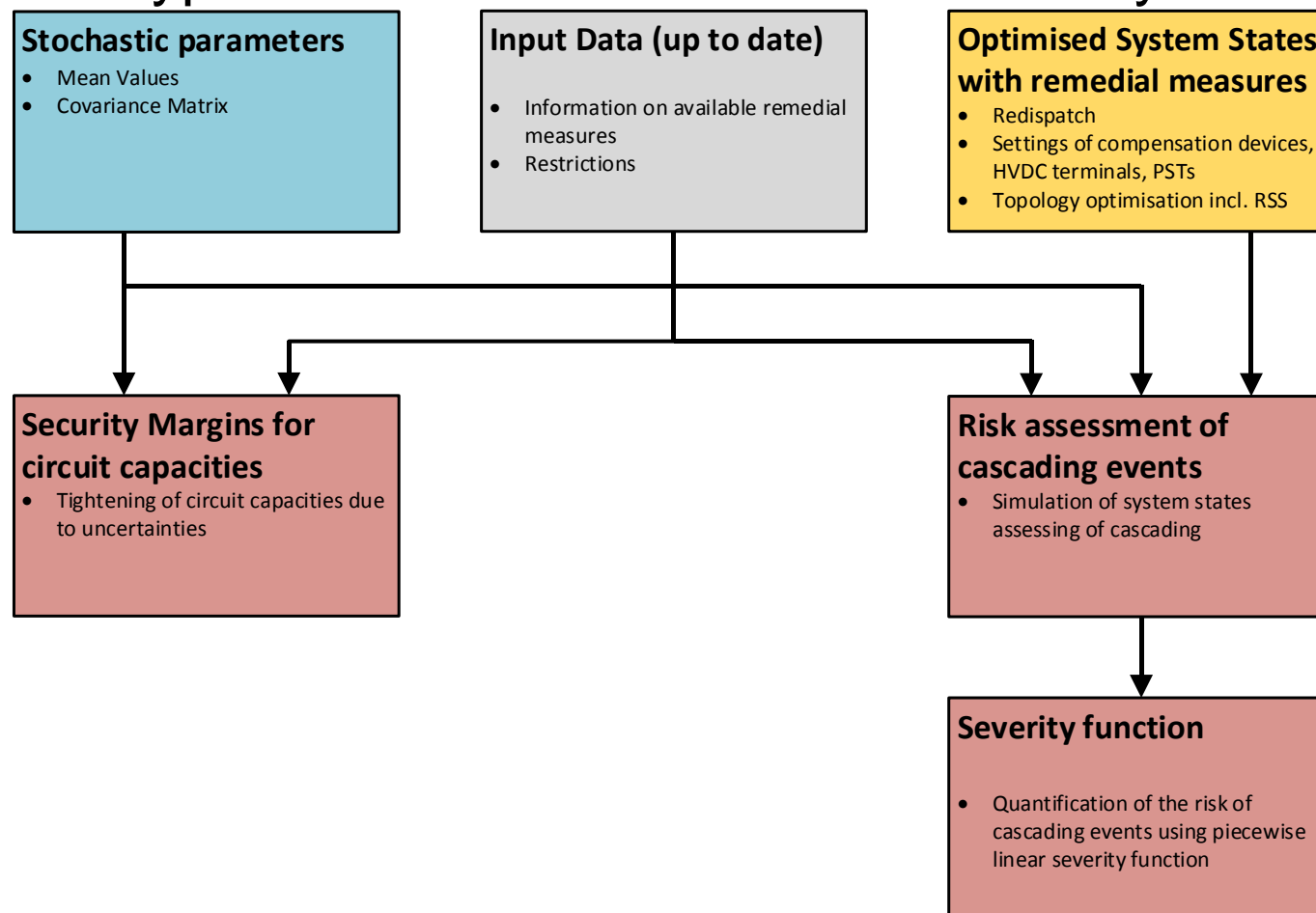
# WP5: Synthesis (2/5)

## • Prototype Modules for Optimisation



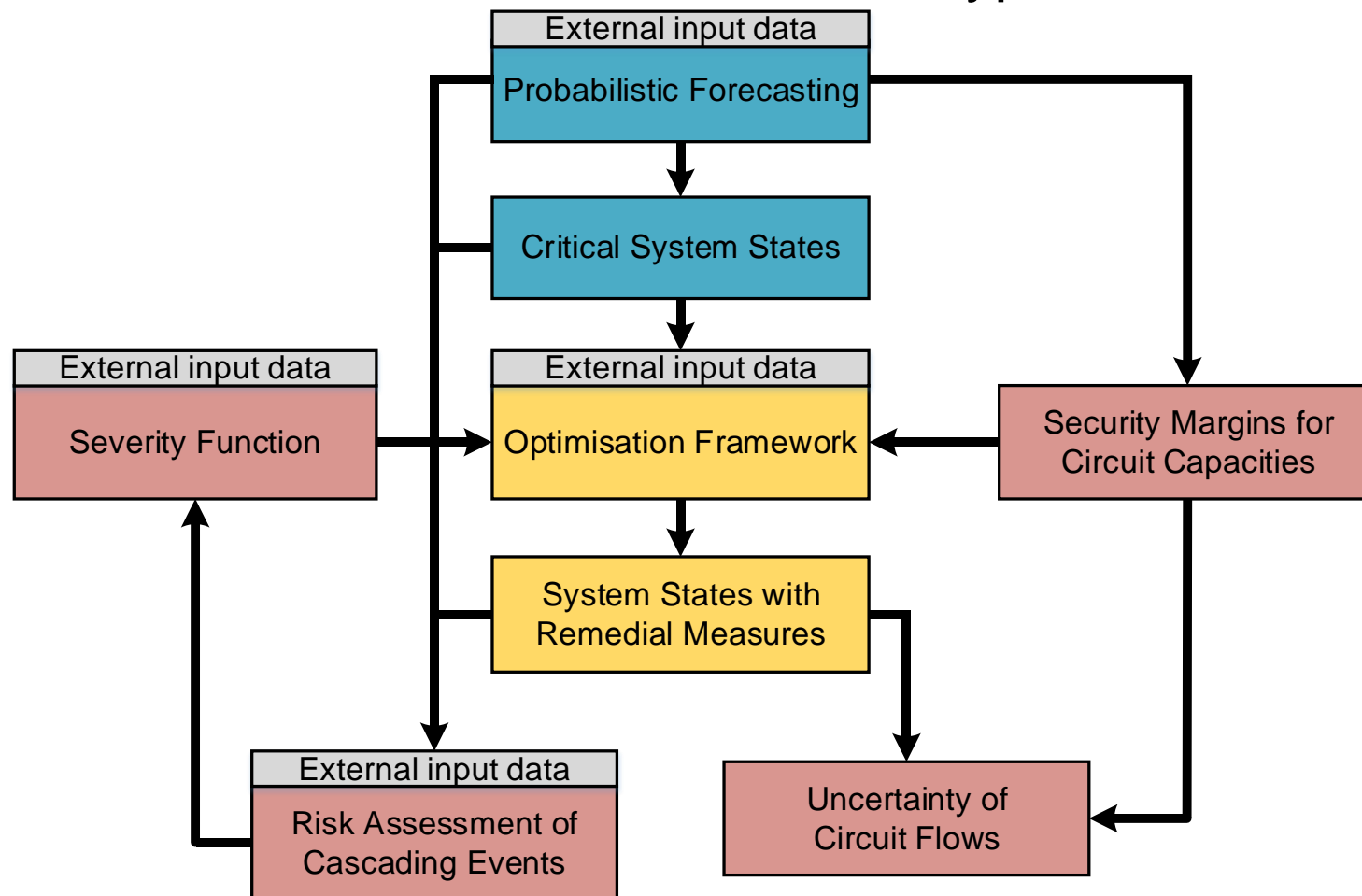
# WP5: Synthesis (3/5)

## • Prototype Modules for Risk-Based Security Assessment



# WP5: Synthesis (4/5)

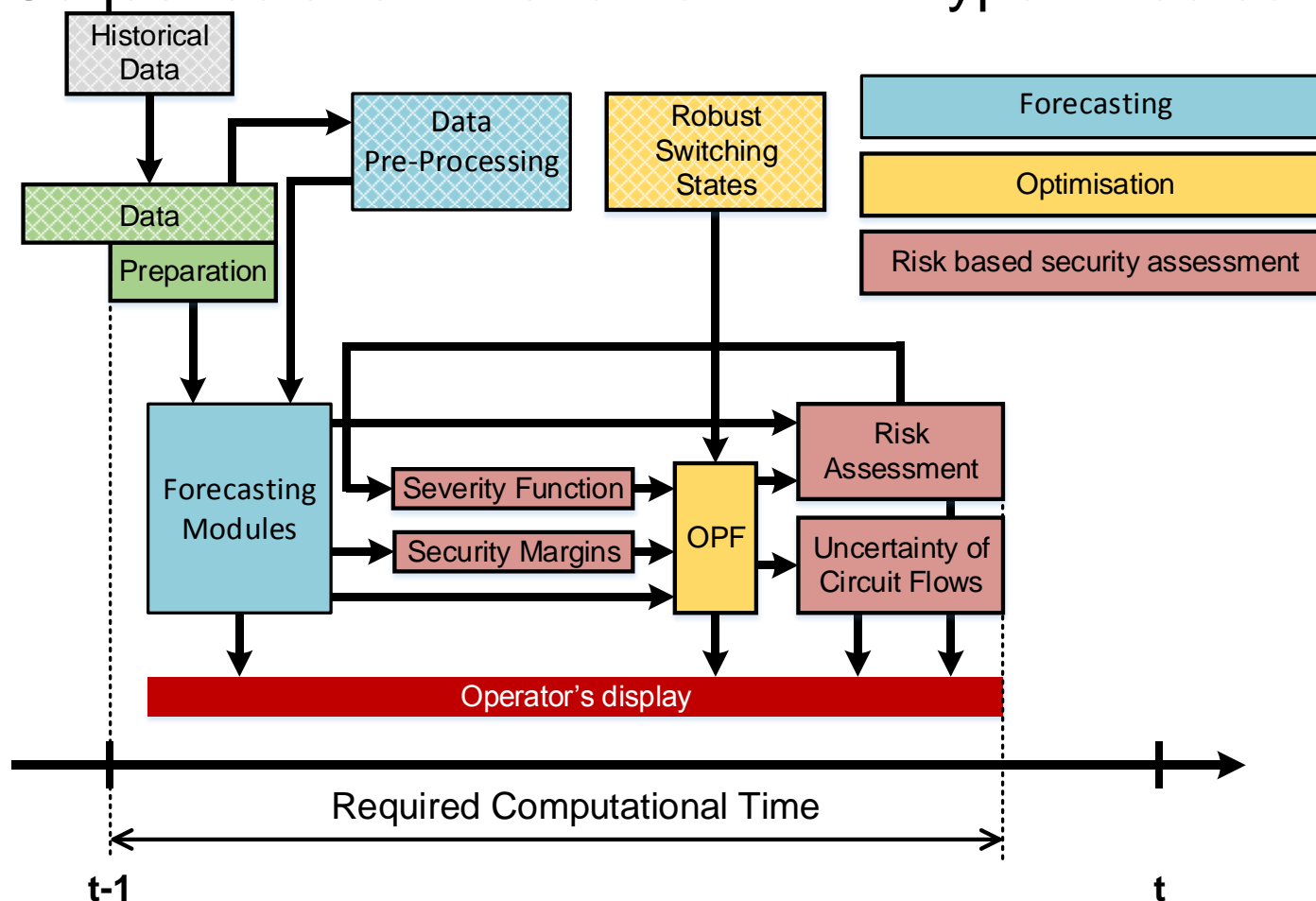
- Overview and Links of Toolbox Prototype Modules





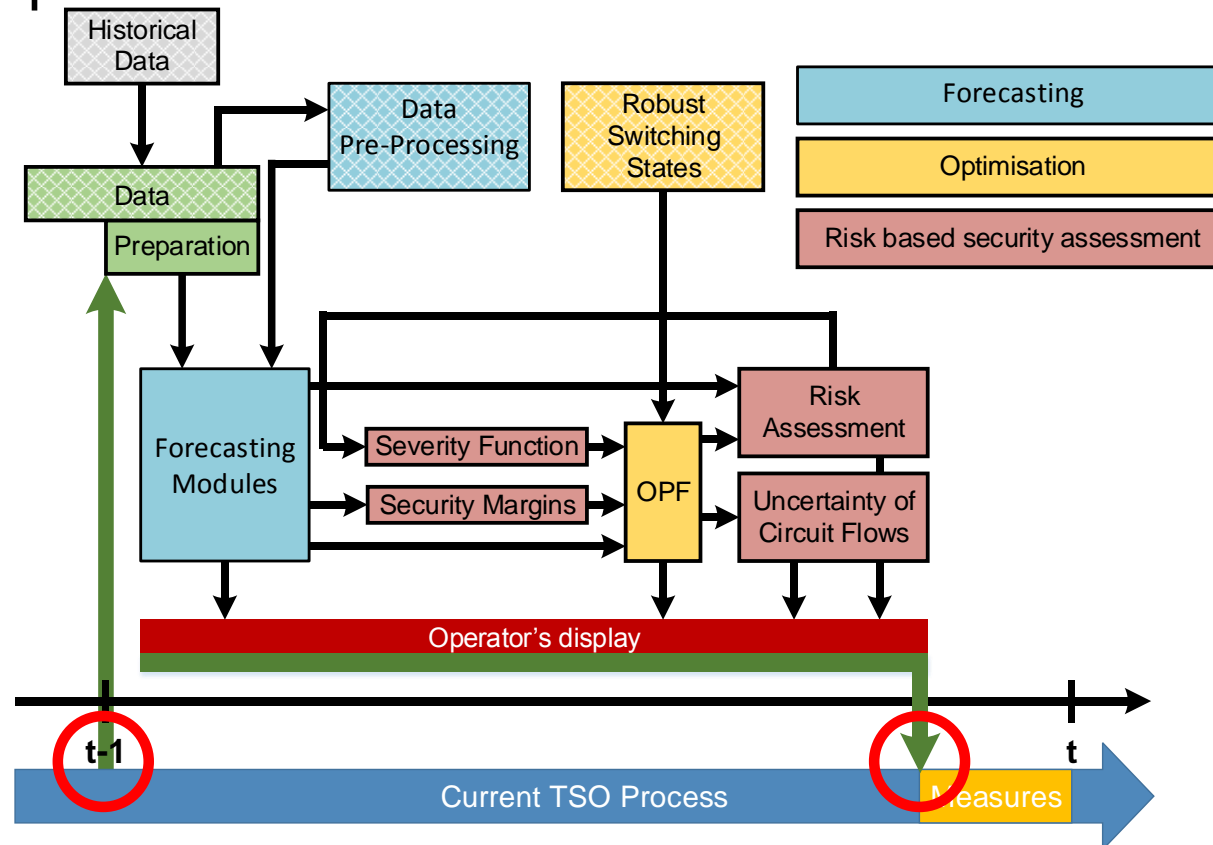
# WP5: Synthesis (5/5)

- Sequence and Timeframe of Prototype Modules



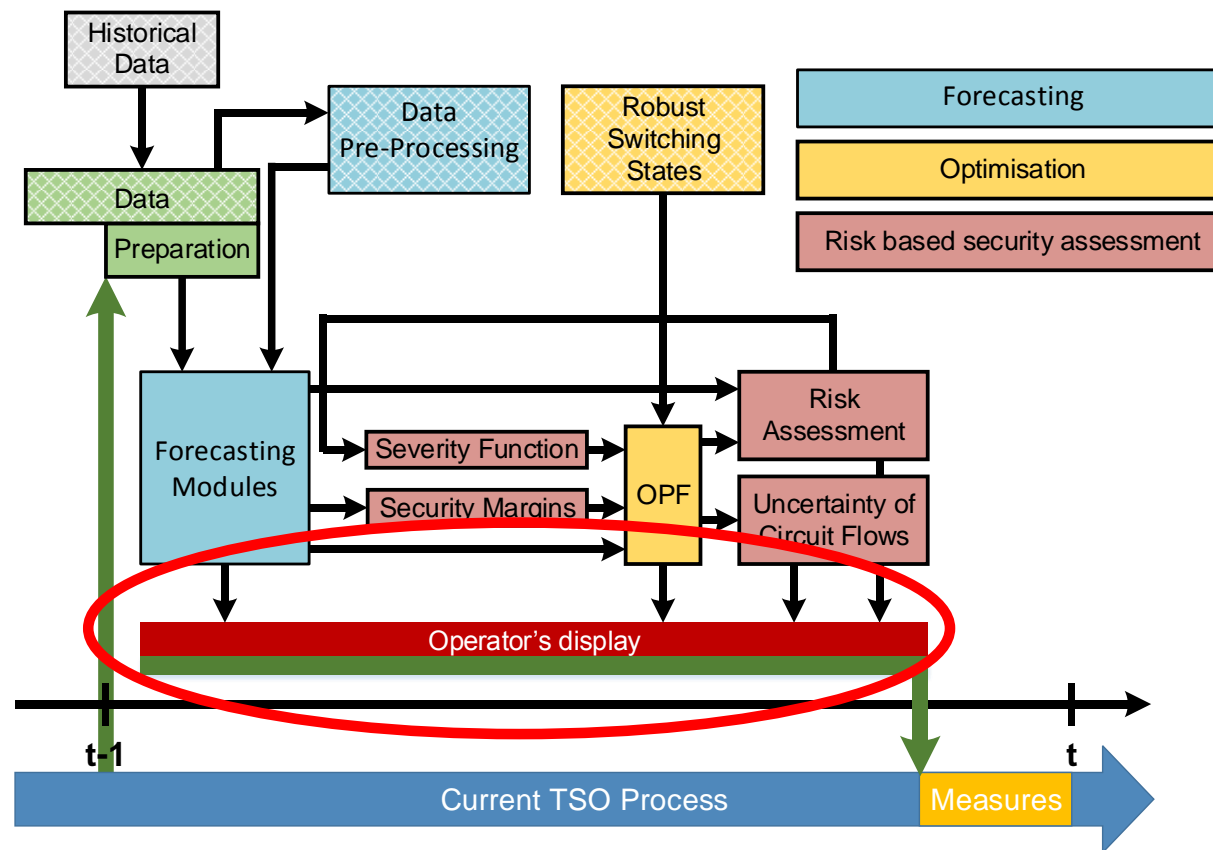
# WP5: Usage Concept

- Analysis of Existing TSO Procedures (DACF, IDCF etc.)
- Development of Interfaces



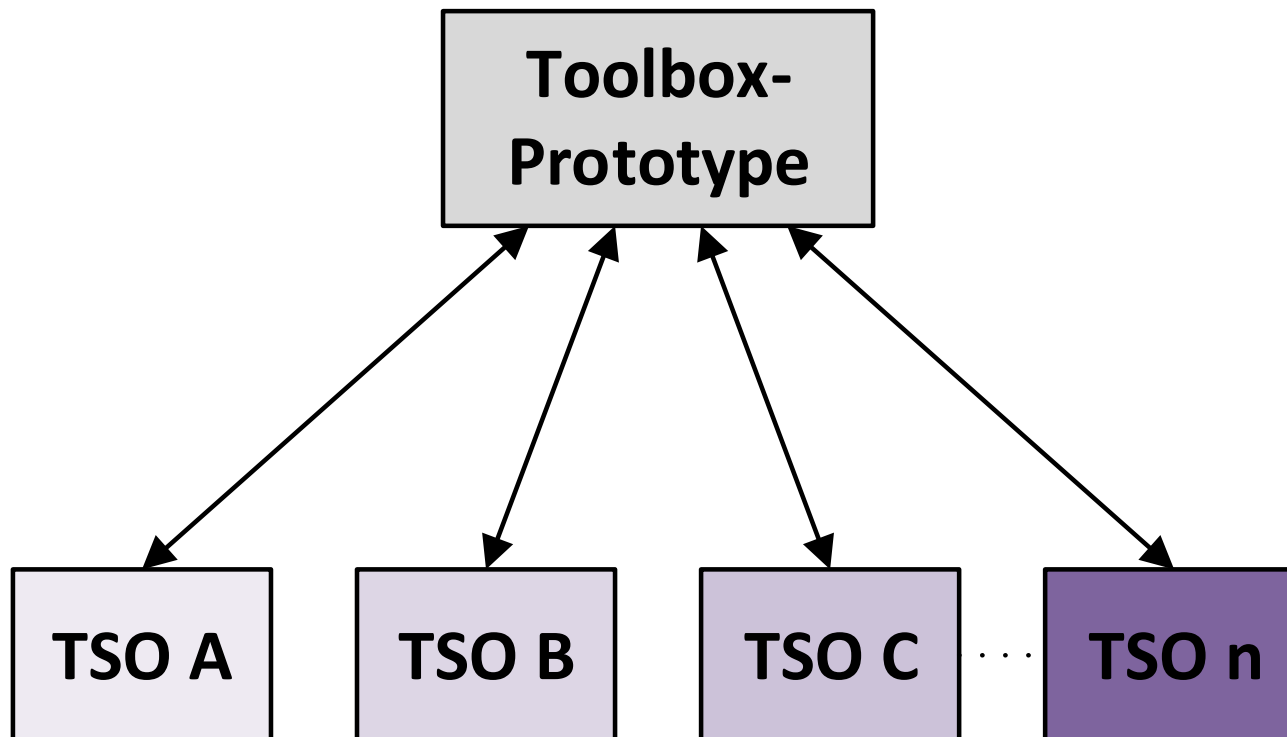
# WP5: Visualisation Concept

- Identification of Outputs to be Visualised on Display
  - All outputs and results are available for operators



# WP5: Prototype Development

- Setup of Toolbox Prototype
  - One central server
  - Bidirectional communication between server and users (TSOs)
  - No data exchange between users (TSOs) required



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# WP5: Next Steps (1/2)

- **Toolbox Design**
  - **Definition of Interfaces between Toolbox Modules**
    - Data exchange and processing of results used as input data for subsequent modules
  - **Description of Interfaces with Current TSOs Processes**
    - Identification of appropriate spots within processes (DACF, IDCF etc.) to extract data and to add toolbox results
  - **Finalisation of Data Requirements**
    - Distinction between available and required data
    - Statement on potential improvement of modules including additional data
  - **Concept for Data Mining/Gathering**
    - Format of available data and required data converters
  - **Development of Visualisation Concepts for Displaying Probabilistic Results**

# WP5: Next Steps (2/2)

- Toolbox Prototyping
  - Finalisation of the Implementation of Optimisation Modules With and Without the Consideration of Uncertainties
  - Testing Prototype Modules with Exemplary DACF-datasets
    - Starting with deterministic approaches
    - Continuing with the consideration of probabilistic forecasts
    - Concluding with the incorporation of risk-based security assessment
  - Implementation of Prototype Infrastructure
    - Setting up of central server and users' hardware
  - Preparation of User's Manual
  - Coordination With “Demonstration & Testing”
    - Preparation of data for test-cases
    - Testing procedure

# Thank you very much for your attention!

Questions?  
Comments?

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This research work has been carried out within the scope of the project UMBRELLA, supported under the 7th Framework Programme of the European Union, grant agreement 282775.

