Integrated Database Use In Fire PRA

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Presenter: Georgi Georgiev

Team: Georgi Georgiev, Paul Guymer, Viresh Patel

Jacobsen Analytics Ltd.

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Introduction

- Databases
  - *Definition:* Structured set of data records
- Database Integration
  - Usually the input data is gathered from different sources, in different formats and with a different level of detail
  - The database integration is the process of putting all data in a single organised structure
- Database Application In Fire PRA
  - Variety of different input data sources
  - Different formats
  - Sometimes conflicting data

Finding a Generic Solution to Data Management Challenges

FRANX/CAFTA - great tools but need pre-processing of the inputs

Spreadsheets and Office package databases (e.g. MS Access) - proved to be inefficient

We need a tool beyond FRANX that can pre-process the data and provide inputs to FRANX/CAFTA in an efficient manner

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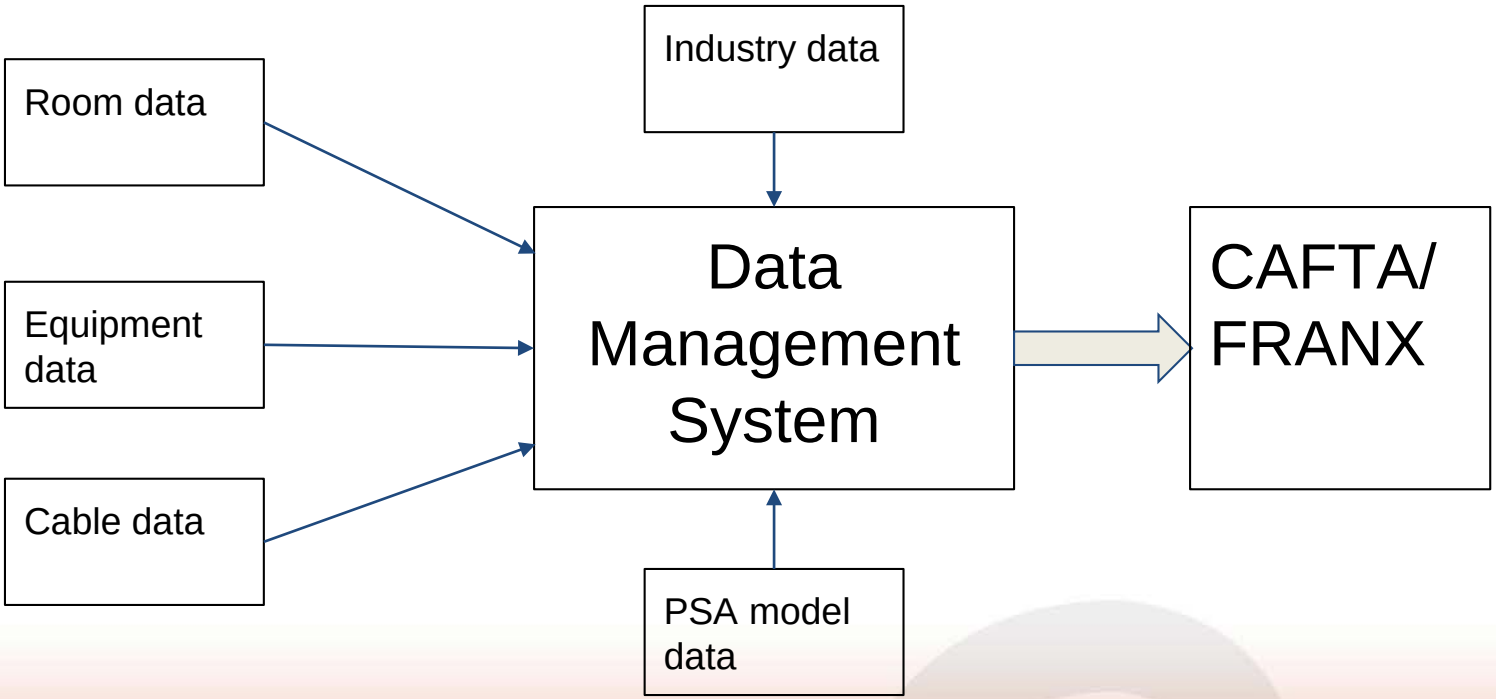
Finding a Generic Solution to Data Management Challenges (figure)



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Underlying Database Management System

Selection of the database engine

Key requirements:

- Multi user support
- Ability to cope with large data queries
- Software stability
- Connection/data security
- Easy integration with FRANX
- Simple management

MySQL found to be ticking all boxes and has a very good reputation among the software developers

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Integrated DB System Features

- Multi user access
- Automated data validation and efficient QA and version control
- Automated FIF calculation
- Automated generation of fire scenarios
- Interface to FRANX
- Automated reporting

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Data Security

- Prevent unauthorised access
  - — Encrypted tunnel access only
  - — Encrypted passwords
- Prevent unwanted data interactions
  - — Strict user access control
- Prevent accidental data loss
  - — Automated regular encrypted backup

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QA and Version Control

Database Structure:

After fine tuning the database framework is verified and frozen. No frequent changes needed. Usually the database version does not change during the project.

Data:

- Automated data validation (records cross check, data format check, etc.)
- Version control implemented on the input data side
- Automated version records with timestamp propagated from input data to FRANX interface

Fire Ignition Frequency Calculation

Inputs:

- Generic Bin Frequency (e.g. NUREG 2169)
- Plant equipment list (including equipment location and FIF bin)
- Transient combustible weighting per PAU

Every input update triggers FIF calculation

Results:

- Report tables
- Fire scenario table in FRANX

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Example 1: FIF Update

Equipment list update:

Step 1: Upload the updated equipment list from spreadsheet

Step 2: Open FRANX in MS Access and update the external links

Step 3: Close FRANX – your model is ready for quantification

Step 4: Export the report table and update your report (works as copy/past as well)

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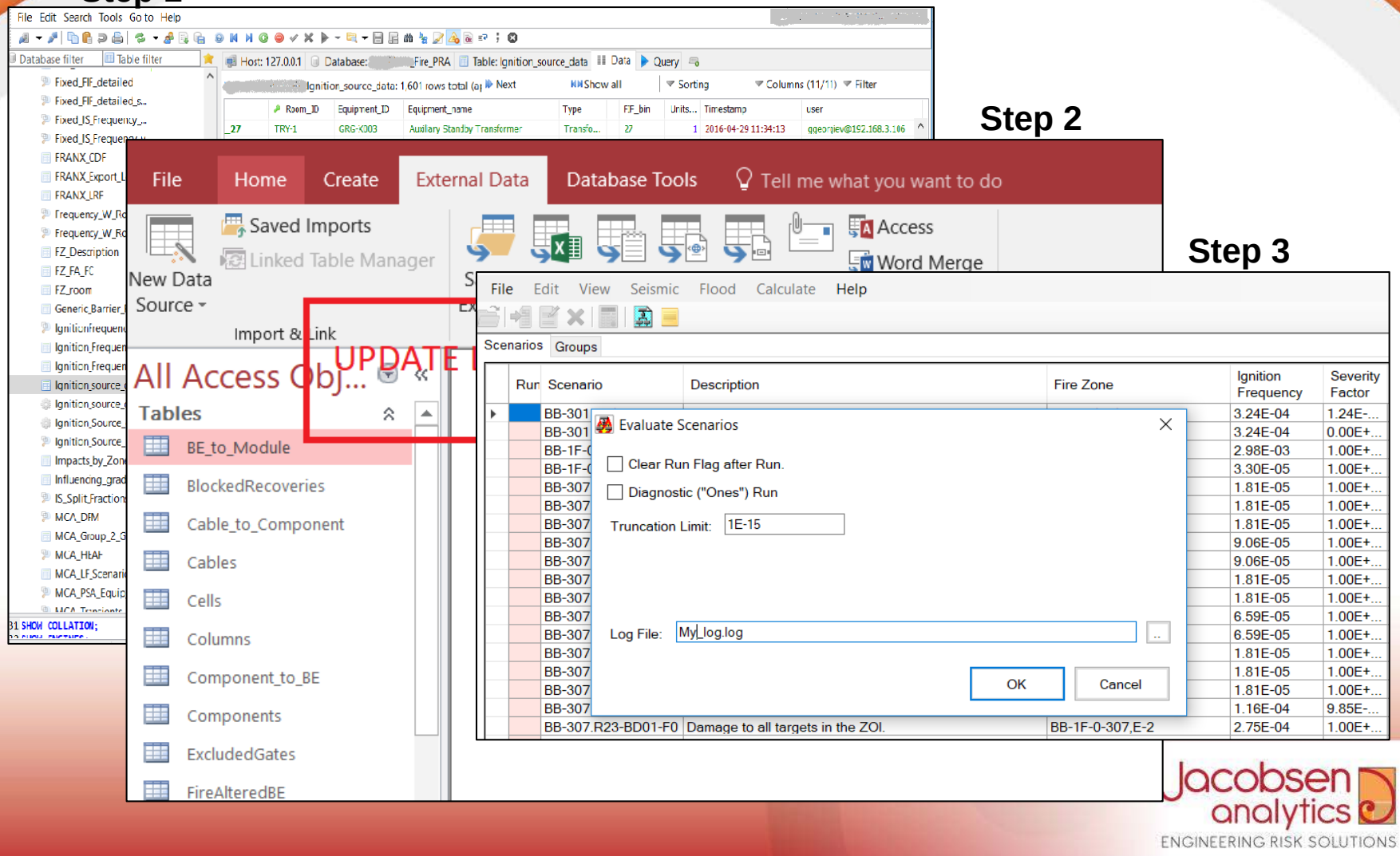
Example 1: FIF Update (cont)



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Example 2: Cable Data Update

Cable Data:

Step 1: Upload the updated cable data table from a spreadsheet

Step 2: Open FRANX in MS Access and update the external links

Step 3: Close FRANX – your the model is ready for quantification

Step 4: Export the report table and update your report (works as copy/past as well)

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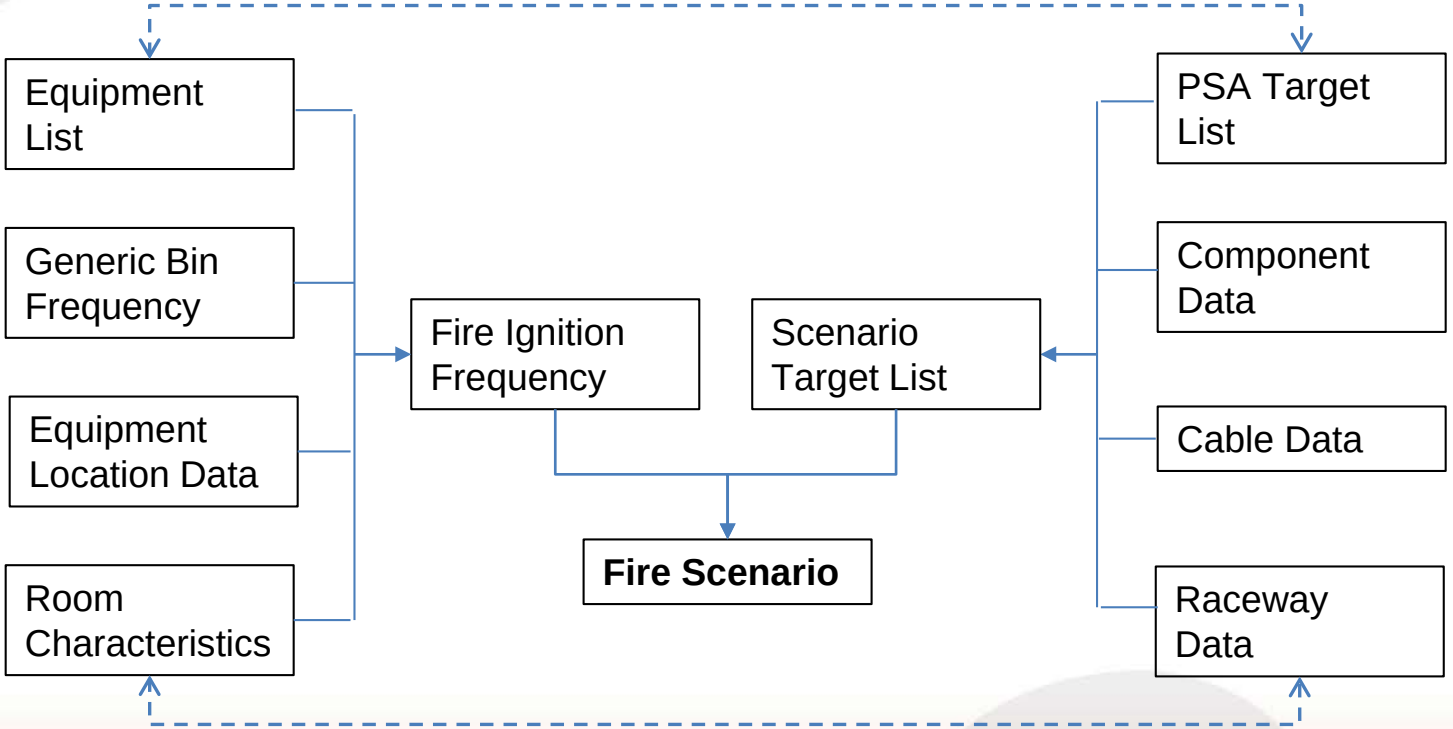
Automated Generation of Fire Scenarios (fig.)



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Automated Generation of Fire Scenarios

Whole room burnout fire scenarios

Inputs:

- Fire ignition frequency
- Cable data

Multi compartment fire scenarios

Inputs:

- Fire ignition frequency
- Cable data
- Compartment adjacency records
- Fire barrier data

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Automated Generation of Fire Scenarios (cont.)

Output:

- Complete FRANX scenario table
- FRANX mapping tables (Compartment-to-Raceway, Raceway-to-Cable, Cable-to-Component, Component-to-BE)
- Additional FRANX tables (HRA, Spurious Operations etc.)
- Report tables
- Part of the detailed fire modelling inputs (IS frequency, location, potential targets)

Future Development

- Common database for other spatial hazard analyses (e.g. Flood, Seismic…)
- User interface
  - Currently relying on 3rd party GUI tools
  - Web interface in planning/development
- Integration with databases used for deterministic safe shutdown analysis

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Thank you for your attention!

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