# Technical solutions for automation of distribution networks based on SPM technology

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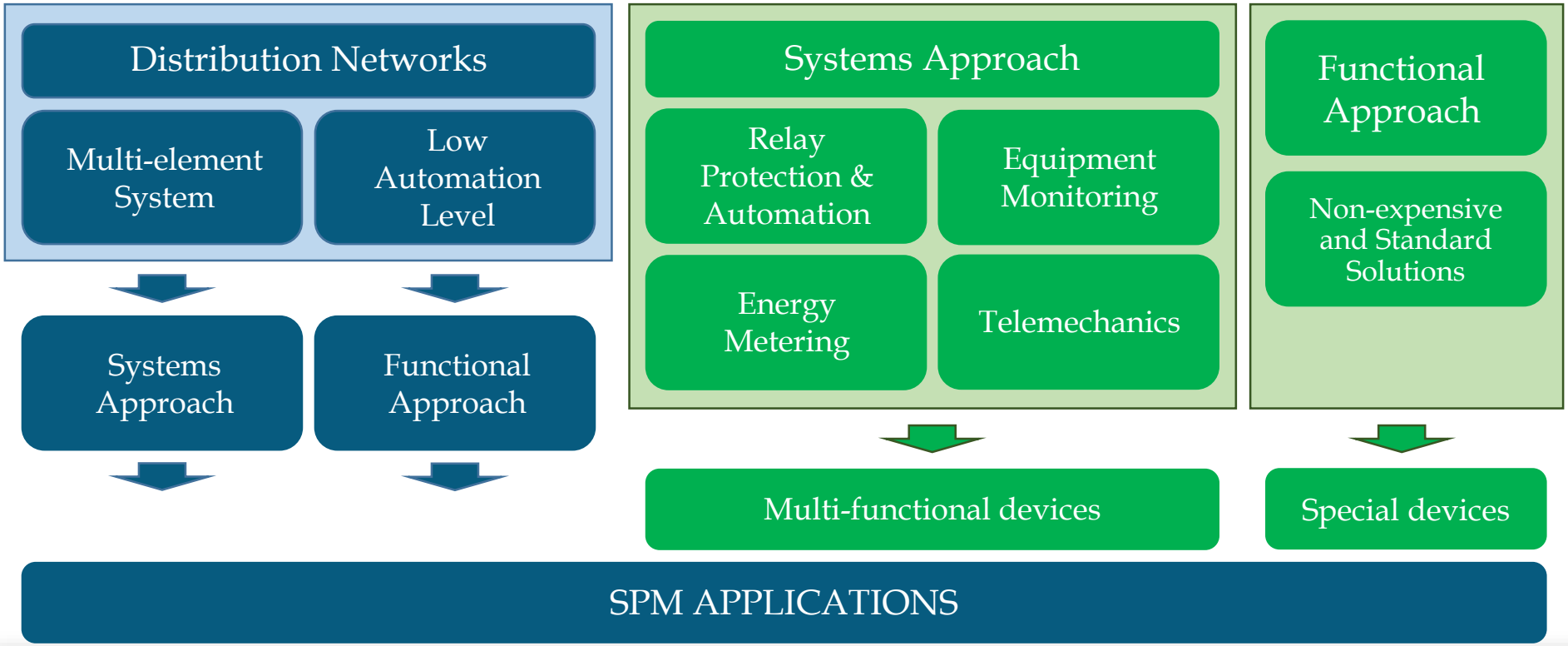
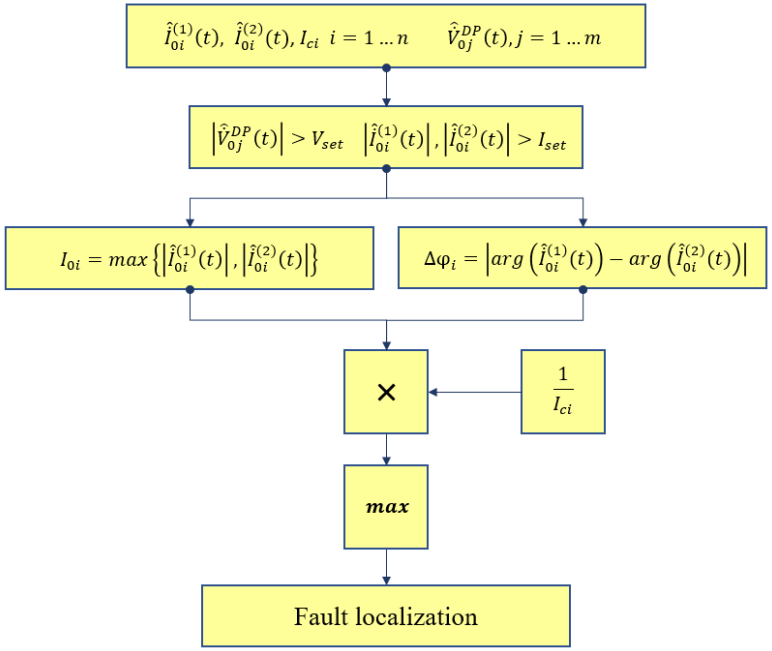
# 1. Automation of Distribution Networks: Concept

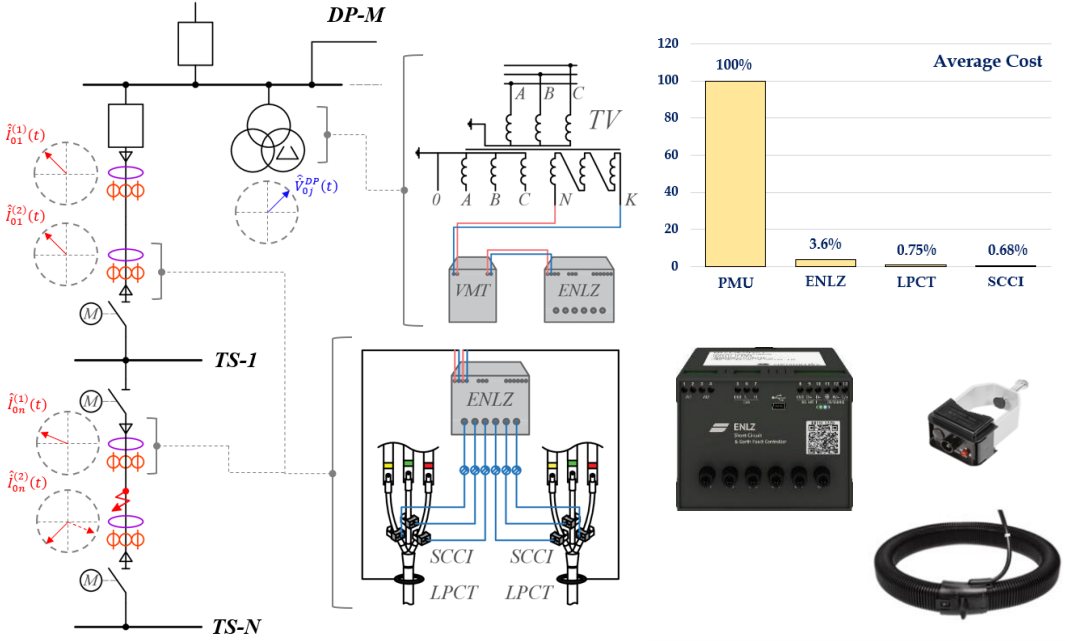


# 2. Functional Approach: Fault Localization System

## SPM Based Method

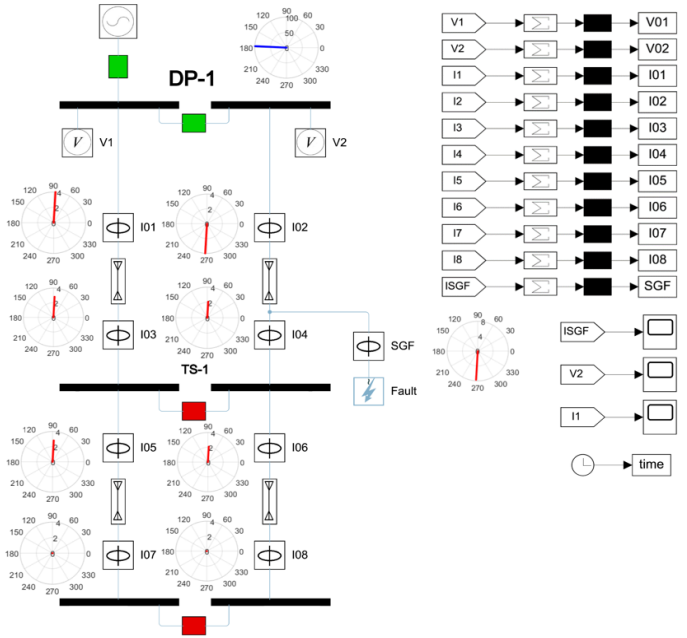



## ENLZ - Special Device with SPM Support



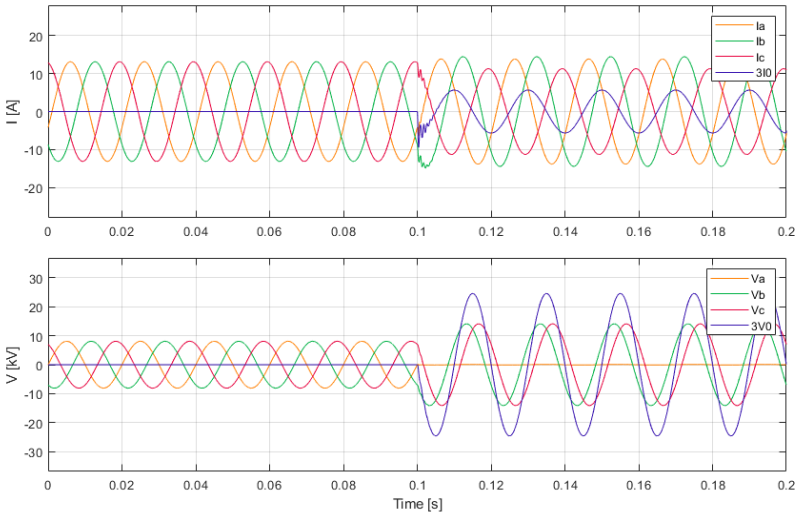
# 2. Functional Approach: Fault Localization System

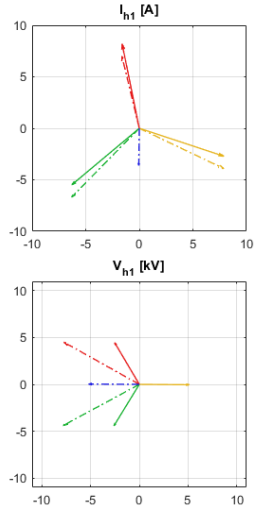
## Simulink Modeling





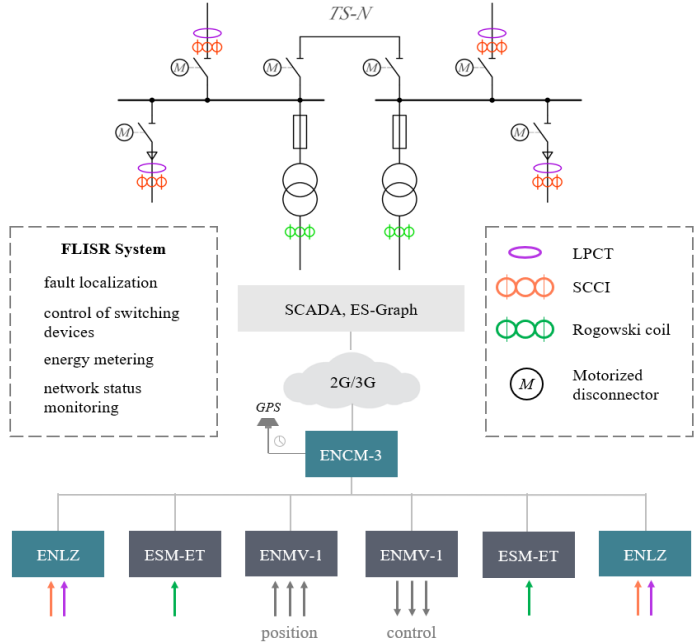




# 2. Functional Approach: Fault Localization System

## Industrial Implementation




# 3. Systems Approach: Automation of Power Centers

SPM Application

Busbar Protection

Transformer Protection

Transformer Monitoring

Energy Monitoring

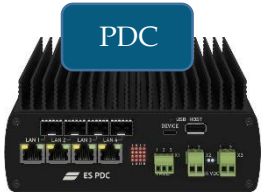
Equipment

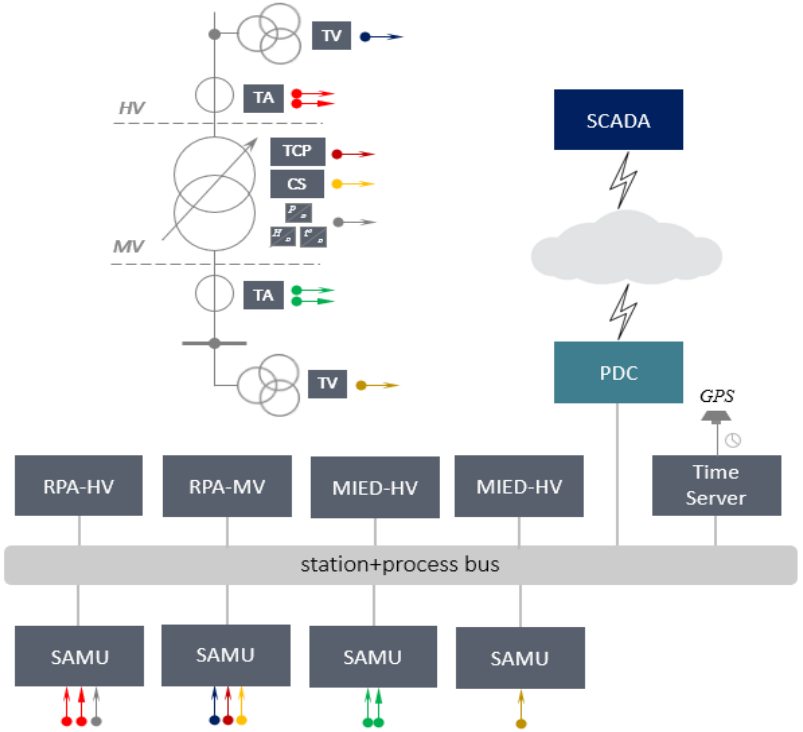
MIED

Timesync

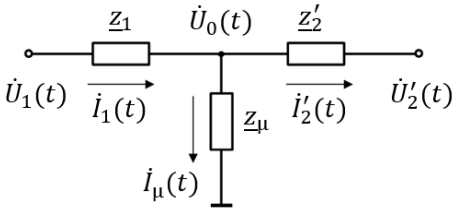
SAMU

PDC

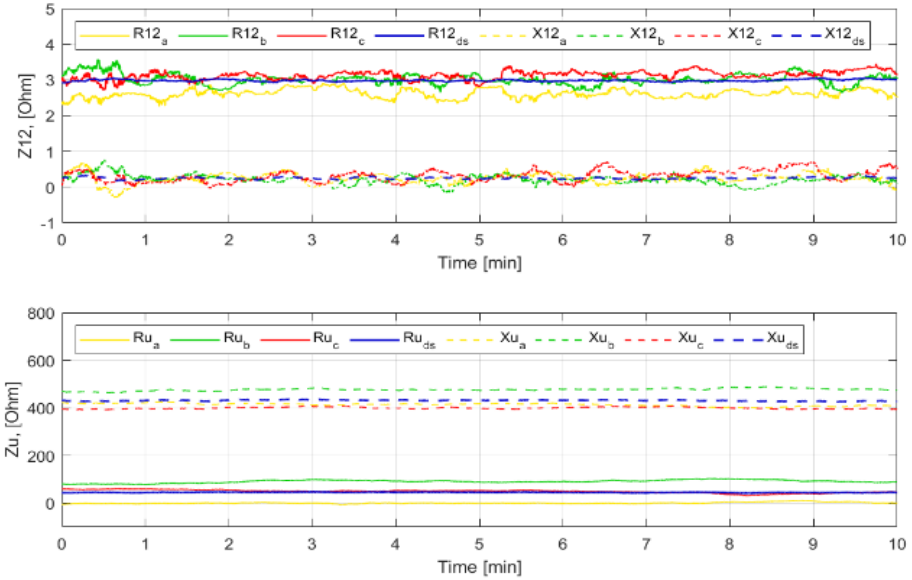




## Transformer Monitoring




| Num. | Parameter | Equation |
|---|---|---|
| 1 | $\dot{I}_\mu(k)$ | $\dot{I}_1(k) - \dot{I}'_2(k)$ |
| 2 | $\underline{z}'_2$ | $\frac{\dot{U}_1(k-n)\dot{I}_1(k) - \dot{U}_1(k)\dot{I}_1(k-n)}{\dot{I}_1(k)\dot{I}'_2(k-n) - \dot{I}_1(k-n)\dot{I}'_2(k)} + \frac{\dot{U}'_2(k)\dot{I}_1(k-n) - \dot{U}'_2(k-n)\dot{I}_1(k)}{\dot{I}_1(k)\dot{I}'_2(k-n) - \dot{I}_1(k-n)\dot{I}'_2(k)}$ |
| 3 | $\underline{z}_1$ | $\frac{\dot{U}_1(k) - \dot{U}'_2(k) - \dot{I}'_2(k)\underline{z}'_2}{\dot{I}_1(k)}$ |
| 4 | $\underline{z}_\mu$ | $\frac{\dot{U}_1(k) - \dot{I}_1(k)\underline{z}_1}{\dot{I}_\mu(k)}$ |



# 4. Conclusion

1. Concept of SPM application
2. Fault Localization System Based on SPM
3. Automation of Power Centers: Solutions
4. SPM devices for Distribution Networks

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