VOLT VAR CONTROL INTEGRATED IN SMART GRID CONCEPT

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REQS FOR PRACTICAL REALIZATION

- **Multi-objective constrained optimization application :**
  - **Returning the network state within constraints as soon as it possible (with minimal number of control actions)**
  - **Improve other less critical objectives: min{power losses}; min{power demand}; max{revenue}; min{voltage deviation}; etc.**
- **Basic characteristics :**
  - **Uses all regulation devices and regulation systems**
  - **Aplicable in (un)balance system with (un)symmetric state**
  - **Fully automated real-time system ⇨ Closed Loop Control**
  - **Practically applicable in real-life ⇨ 24 / 7 / 365**

VOLT VAR CONTROL (MANAGEMENT) SYSTEM

as a part of ADMS which is together with SCADA system integrated in Smart Grid

PROBLEMS

- **Wishes and Practical Possibilities :**
  - **Everybody wants the best**
  - **Technical, software and DPU constrains and limitations**
- **Modelling and calculation :**
  - **Elements and effects**
  - **Optimization problem**
  - **Data uncertainty and sensitivity of optimal solution**
- **Practical realization :**
  - **Command execution**
  - **The transition from actual to optimal state**
  - **Unpredictable events and effects**
- **Measurements and Verification (M&V) :**
  - **Model and Idea**
  - **Data and Software**
  - **M&V of VVC Benefits (quantification)**

COMPROMISE

In theory, theory and practice are the same.

In practice, thay are not!

Complex methods proposed in the literature

Wishes and Possibilities of distribution utilities

C O M P R O M I S E !!!

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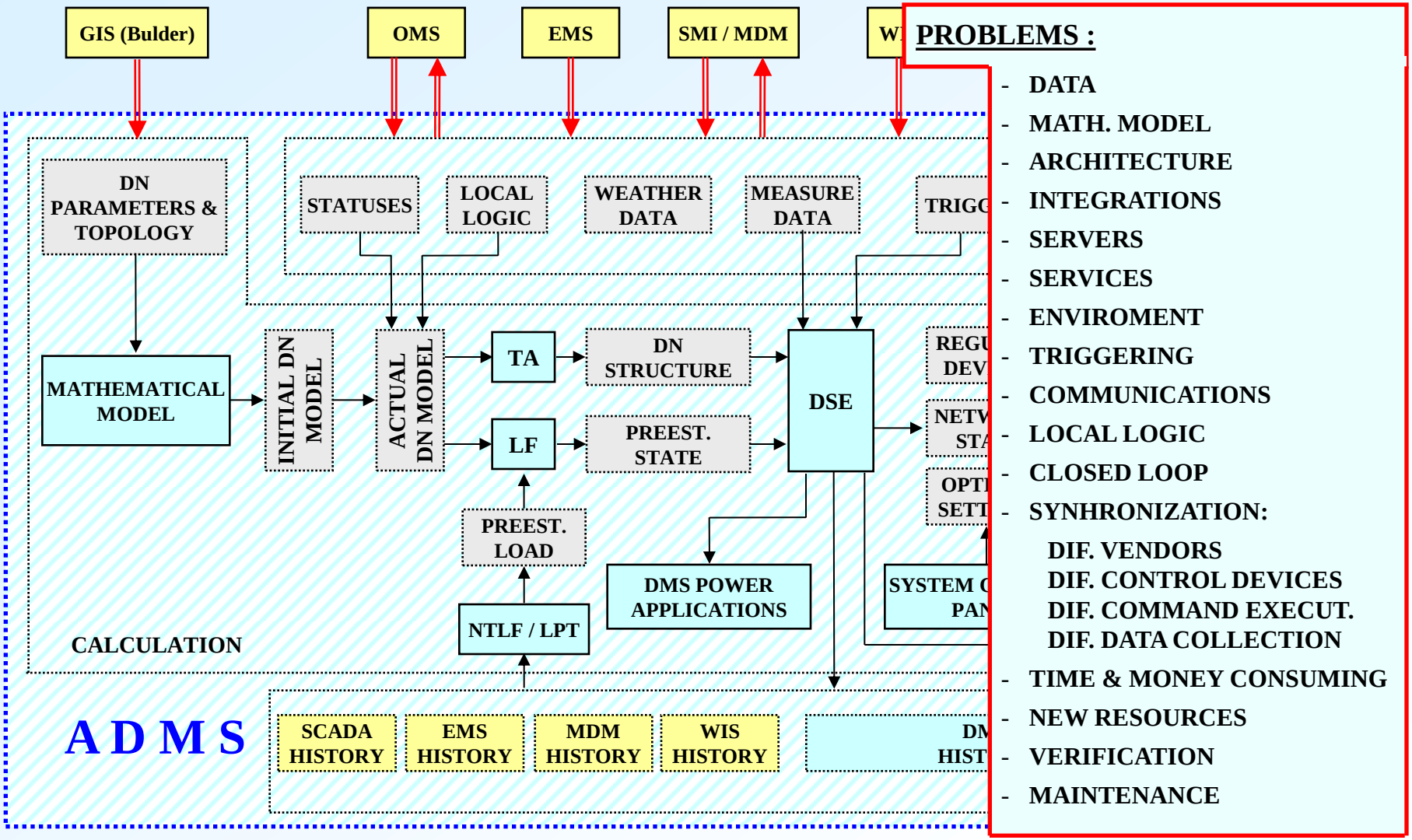
Where are we now ?

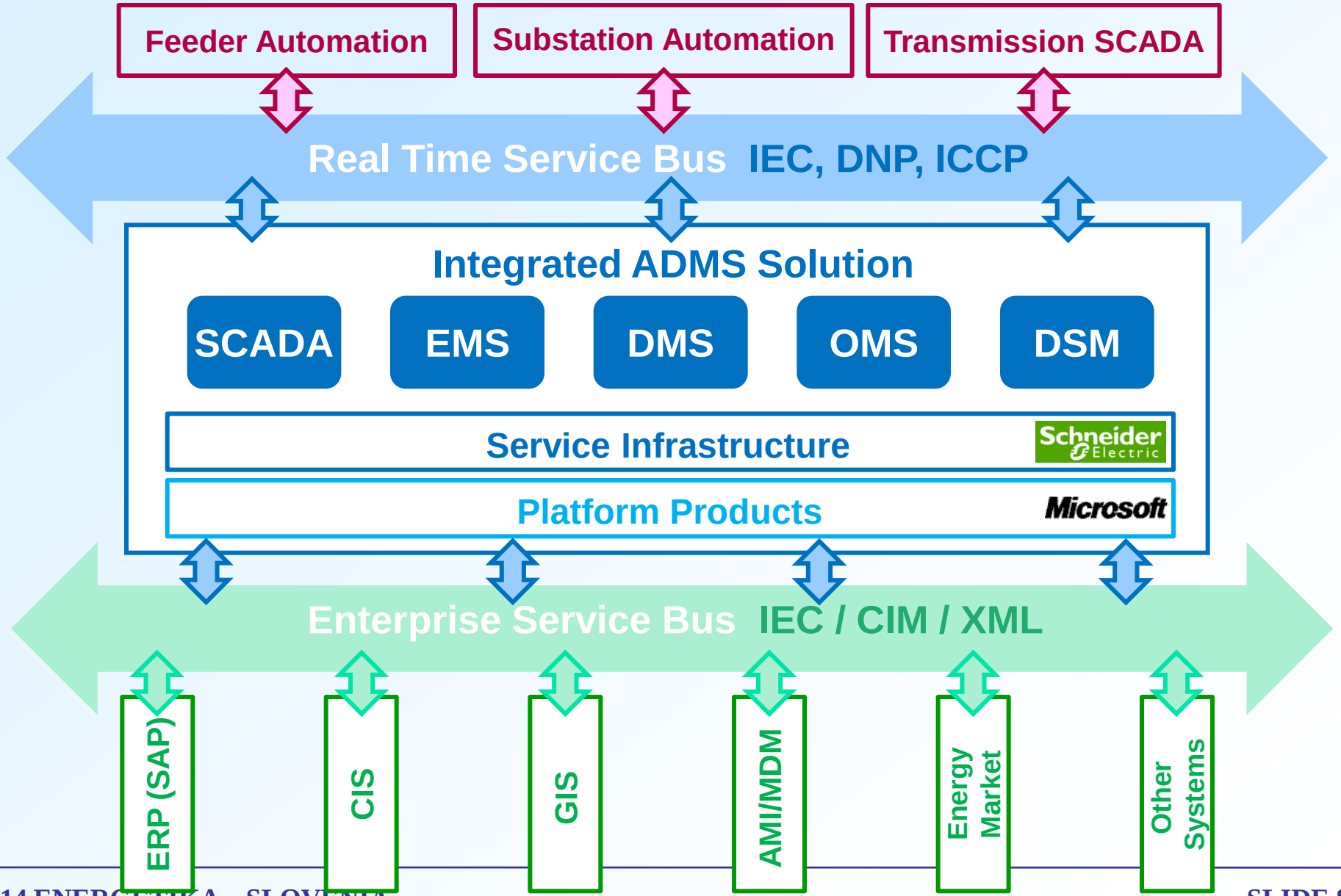
Industrial Volt Var Control

Where are we going ?

VVC – INTEGRATED IN ADMS



ADMS – GLOBAL ARHITECTURE



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Where are we now ?

Industrial Volt Var Control

Where are we going ?

WHERE ARE WE (GOING) ?

- **We are in Smart Grid era :**
  - **AMI/MDM, DG, IPP, EV Charging, Energy Storage, …**
  - **The large-scale deployment of Smart Meters**
  - **From being in an under-determined to over-determined state**
  - **DN is being developed from totally passive to active DN**
  - **DN goes from uncontrolable into entirely controlable system**

- **Where are we going :**
  - **Direct Load Control**
  - **ADMS self-learning**
  - **Model self-correction**
  - **Full automatization ⇨ ADMS in Closed Loop**
  - **Smart City & Smart House**

INSTEAD OF CONCLUSION

What have we learned by imeplementation of IVVC in the field ?

- **Mathematical model is just one of the problems (a smaller one)**
- **IVVC needs Investments in distribution infrastructure**
- **Realization of IVVC is a very expensive and time consuming process**
- **IVVC cannot be realized on one computer (server)**
- **IVVC cannot be done by one man or small group of engineers (this work includes participation of many well-organized various experts)**
- **IVVC is Volt Var Management integrated in Smart Grid Concept**

BUT

Industrial VVC can be realized in Real-Life !