# SYSTEMS ANALYSIS LECTURE 12 SYSTEM ARCHITECTURE, SYSTEM IDENTITY

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# System architecture

- Purpose-built system model of particular object or system, that has to fit into the given space and at the same time to effectively execute given of recognized system functions
- Definition specification directly or indirectly show real existence conditions of particular object ( “system constrains“)
- Dimensions
  - Time
  - Costs
  - Resources
  - Etc.

# System architecture

- Must be based on the systém reuirements

- Creating system architecture
  - Finding out customer expectations
  - Transforming the imto formal requirements
  - Finding solution – creating the architecture from different perspective
    - Functional
    - Physical
    - Organizational
    - Etc.

# Architecture

- System architecture can be viewed also as unification construction of three system models
  - object (what)
  - infrastructure (where, when)
  - purpose (how, why).
- If we emphasize the
  - object, it is the developing architecture
  - infrastructure, it is the real architecture
  - purpose, it is the theoretical architecture, preferring the system theoretical viewpoints

# Architecture types

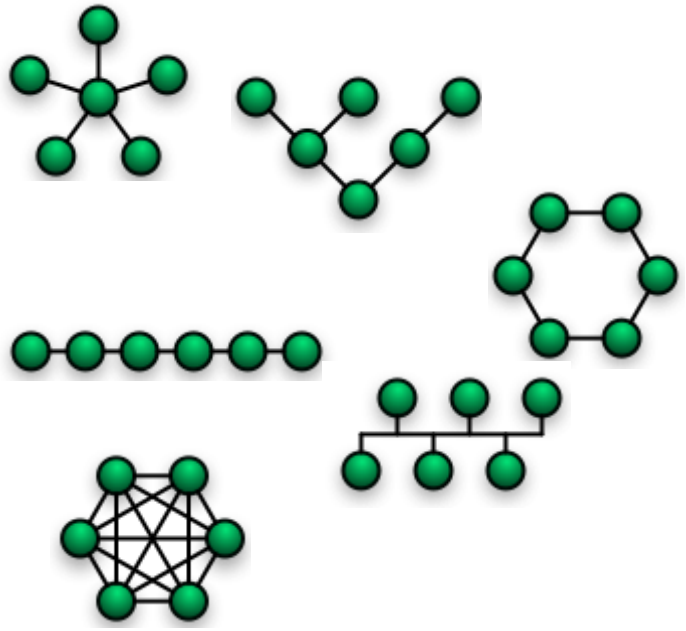
- Pragmatic sorting – e.g. in transport telematics
  - Functional
  - Physical
  - Communication
  - Organization
- E.g.the different viewpoints in the telematic ITS European architecture FRAME

# Architecture types

- Based on the level – e.g. in transport telematics
  - Global
  - European
  - National
  - Local

# Architecture types

- Topology types – used in computer technology
  - Star
  - Tree
  - Ring
  - Line
  - Bus
  - Mesh
  - Fully conected



Source: https://en.wikibooks.org/wiki/Communication_Networks/Network_Topologies

# System identity

- Every system is placed in some neighbourhood, part of some higher system, …
- Important task in the system analysis is recording the relation (both quantitative and qualitative) between the system and its super system
- It shows the system characteristic regarding the coherence, generic classification, goal aiming and acceptance by the super system

# System‘s Identity – internal part

- Quantitative construction of Identity forms a 7 dimensional vector of the components:
- 1. “Tuning”: **Tu = ΣIFR / Σ IF,** where Σ **IFR** means the number of all regular interfaces in the respective system, while Σ **IF** means the total number of interfaces in this system
- 2. “Type”: **Tp =** Σ δ **/ M,** where Σ δ means the number of strong processes in the system of interest, while **M** means systems magnitude (*i.e. the cardinality of the set of Systems processes*).
- 3. “Goal - weight”: **Gw =** Σ γ **/ M,** where Σ γmeans the number of goal - oriented processes in the system of interest, while **M** means systems magnitude.
- 4. “Goal – stability”: **Gs = 1 – D (**γ **),** where **D (**γ **)** means the averaged dispersion of goal – oriented processes in the system of interest.

# System‘s Identity – external part

- 5. “Extrovert orientation” : **Ex = OUT / (IN+OUT)**, where **OUT** is total number of output states (i.e. the sum of the output boundary element states of the system of interest) while **(IN+OUT)** is total number of the states of the system boundary elements.
- 6. “Importance” (for the higher system HS) : **ImHS = OUT** δ **/** δ **HS ,** where **OUT** δ is the number of output states of the strong processes of the system of interest, participating in the same time in the strong processes of the higher system HS, and δ **HS** is the total number of strong processes of HS.
- 7. “Coherence of goals” (with higher system HS) : **CgHS = OUT** γ **/** γ **HS** where **OUT** γ is the number of output states of the goal - oriented processes of the system of interest, participating in the same time in goal - oriented processes of the higher system HS, and γ**HS** is the total number of goal – oriented processes of HS.

# System‘s Identity - summary

- Systems identity can be described as set
  - [Tunning,
  - Type,
  - $Goal_1$,
  - $Goal_2$,
  - $Acceptance_1$,
  - $Acceptance_2$,
  - $Acceptance_3$]

# Other tasks in the systems analysis

- Identification of the identity of the original
- Homogenization – how parts of the whole adapt
- Tasts on systems interactions, e.g.
  - Contamination tasks
  - Immunity tasks
- Tasks on ordering and self-ordering – existence a reliability in dynamicaly changing environment
- Tasks on navigation in the state space
- …

Thank you for your attention