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## CLASSIFICATION OF DISTRIBUTION NETWORKS

**Abstract:** Distribution networks are possible to create from the final number elements. Topology of distribution networks as one of strategic decision of the design logistics system is depending on the quantitative factors, business position on the market, type of products, volume of production, location business and warehouses, from status of firm activities, from the number and its capacity of the distribution resources and other.

**Keywords:** distribution, distribution network, space of distribution, elements of distribution network.

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### 1. Introduction

From the reason to definite the space of the solution is needs define the distribution region and with this contiguous distribution subjects and objects. For analyse of distribution system, it means definition of the elements and distribution network structure – topology and scheduling the distribution path is needs to know the layout elements in the distribution network (Straka 2005a).

### 2. Criteria selection for distribution networks design

For the distribution network structure have a big influence the right specification of the criteria, distribution factors. Distribution factors we can divide into following groups (Straka 2005b, 2007):

- criteria for definition the form and size of the distribution space,
- criteria, which effect on topology distribution network,
- criteria, define the course of distribution (behaviour).

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### Criteria define form and size of distribution space

Distribution space is bounded distribution territory – region, whose component is all distribution places, distribution resources, distribution network and its mutual system connection. Distribution space is created with elements participating to distribution process. The boundaries are defined by the bound elements of the distribution network. Criteria which define form and size of distribution space are:

- distribution source,
- distribution centres,
- consumers,
- distribution channel,
- distribution network.

The right criteria selection and definition is dominant condition for define distribution network and influence the form of distribution network. About criteria selections make decision the distribution system designer. Distribution network as a system consist from consumers (C), distribution centres (DC), distribution source (DS) and its mutual connection (Straka 2010).

**Consumers** are elements of distribution network, which are cumulated and consequently use the products. **Distribution centres** are elements of distribution network – distribution knots, which temporary cumulate and storing products and consequently are distributed into the places of consumption.

**Distribution source** is central element of distribution network, which manufacture the goods and consequently are this products distributed into the distribution centres and distribution places or directly to consumers.

**Distribution network** (see Fig. 1) is interconnection of distribution places by the distribution devices to be fulfilling the consumer's demands. The form and structure distribution network is specific by the number of distribution places its layout and its mutual connection.

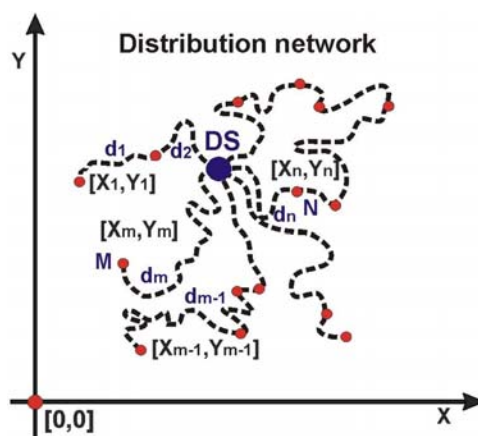


Fig. 1. Structure of distribution network

**Distribution channel** is the system of the subjects performing the flows of the real, material and information products.

The criteria for the topology design of distribution network The definition of the distribution network is based on the topology definition „geometry deal with position of geometric elements“. Distribution network topology is enquiry into mutual connection of distribution places allocation, which create distribution network. Criteria which influence of distribution network elements are:

- position of distribution elements in space,
- maximal distribution time,
- maximal length of distribution trajectory,
- places priority in distribution structure,
- means of transport capacity.

The criteria for the course of distribution define (behaviour). Into criteria which define of course of distribution is possible define:

- climatic and geographic status of region,
- momentary atmospheric conditions, weather,
- properties and specific of transported goods,
- legislation of state and European Union.

### 3. Classification of distribution network

Distribution networks are possible classified:

- one-way distribution nets,
- basic distribution nets,
- complicated distribution nets.

One-way distribution network is a tree was distribution goes from root to leaves or opposite but never in both directions, duplex regime (Fig. 2). One-way network can have form „TREE“. This distribution is for example water distribution or gas distribution into the consumer sectors, where one shared base is branching on smaller branches, feeder lines, which supply goods directly to single recipients (Dorčák 2004, Rosová *et al.* 2009). Example of reverse direction distribution is sewage network, which has base in quantity of producers, which join together and created one big shared distribution source.

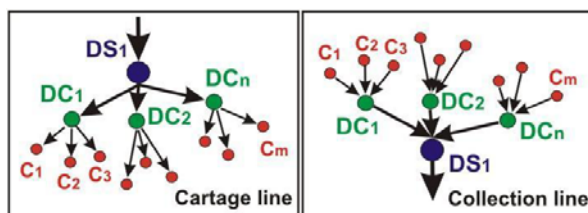


Fig. 2. One-way network tree type, cartage type and collection type

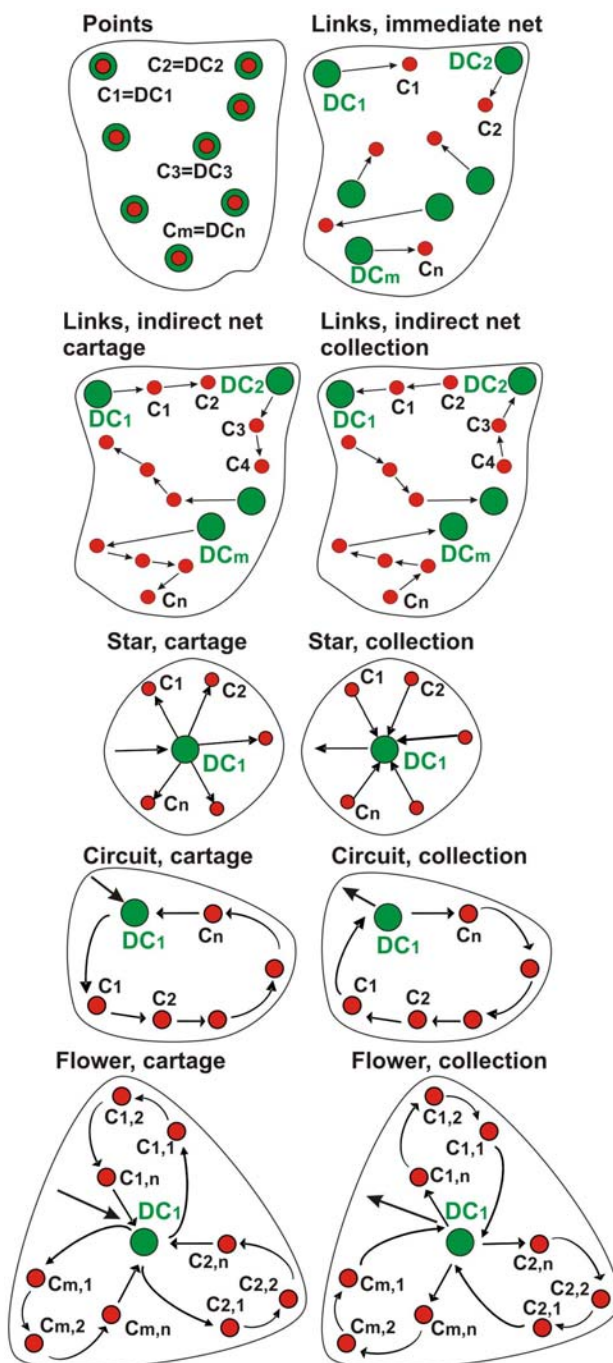


Fig. 3. Basic types of distribution nets

Types of basic distribution networks depend on especially in the way transfer, by this we can partition (Fig. 3) networks on:

- point distribution network,
- line – immediate distribution network type,
- line – indirect distribution network type,
- distribution network star,
- distribution network circuit,
- distribution network flower.

**Point network** is characteristics by, that distribution products between producer and consumer do not exist, but production, sale and consumption products to run in one place (e.g. services), in our image is network creation by the points without connection.

**Line – immediate network type** is creation immediate connection between producer and recipient.

**Line – indirect network type** is creation connection between producer and a few recipients, which in distribution process serve the same means of transport so, that start and finish distribution are not in the same place.

**Network star type** is creation several recipients, or contractors, which product supply or product collection is executing from shared distribution centre most frequently from some warehouse.

**Network circuit type** is characteristics by, that during one's distribution round is doing attendance of several distribution places so, that means of transport has start and finish distribution are in the same beginning distribution place.

**Network flower type** is characteristics by, that distribution places supply execute from shared distribution centre so, that means of transport has start and finish distribution in the same distribution place, but on the one distribution round is not possible from time, capacity, distance and other possibilities able serve all distribution places. In one distribution connection have to be least two distribution places, otherwise is creating distribution network star type. This sequential distribution individual distribution places create distribution network flower type.

**Complicated structure of distribution networks.** If in distribution process are representation distribution places with sequence on distribution warehouses and distribution headquarters, is possible to define another types of distribution networks as combination link, star, circuit and flower. In distribution process is structure of distribution networks create combination of listed distribution networks types. Combination can be developed following distribution networks types (Fig. 4). In these networks can be parts target to distribution of goods, haulage of goods or their combination and network parts which are only one-way distribution.

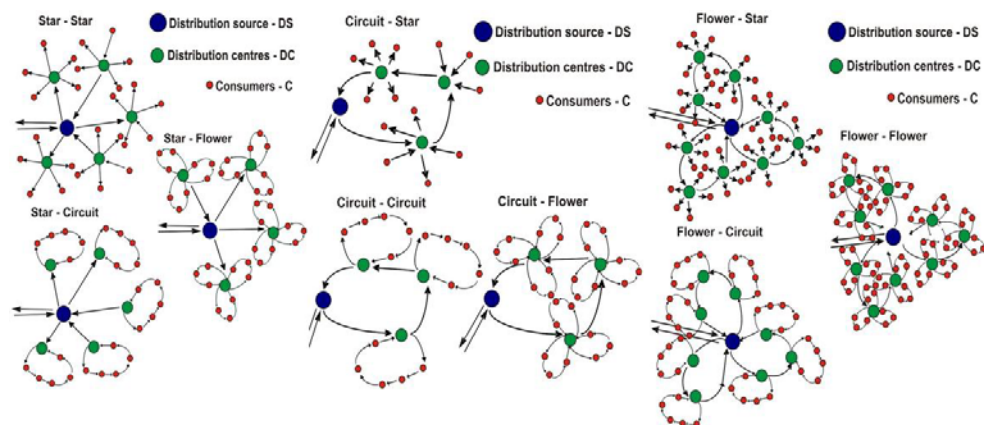


Fig. 4. Complicated structure of distribution nets

### Static and dynamic distribution networks

Dependence on type means of transport and mode of distribution operation in practice exist two types of distribution networks:

- static distribution networks,
- dynamic distribution networks.

Static distribution networks are networks, which distribution form, mode and character is not change in the time. Examples static distribution networks are e.g. oil pipeline, gas pipeline, water, gas and electric distribution, sewage networks (Rosová 2007, Bindzár *et al.* 2009).

Dynamic distribution networks are networks, which distribution form, mode and character is change in the time. Examples dynamic distribution networks are e.g. distribution goods per order.

Form of static distribution network is defined by form of distributing pipe gas pipeline, water pipeline, hard attachment distribution pipes, or static distribution network create always equally running distribution. Form of dynamic network is changing at need. On dynamic networks has major usage dynamic scheduling trajectory of distribution, according to need for distribution goods (Cohen, Huchzermeir 1999, Čambál, Cibulka 2008).

## 4. Linkages between distribution network elements

At solution of distribution problems is tendency to obtain maximum summary of distribution linkages between distribution places. Varied quantum of distribution places take part of distribution process. Interconnection and realization of specific distribution mode making following types linkages (Fig. 5):

$$1-1, 1-m, m-1, m-n, m-1-n$$

Linkage type 1-1 means, that exist immediate connection between one distribution place on entry and one distribution place on exit. Connection can be immediate or cyclic.

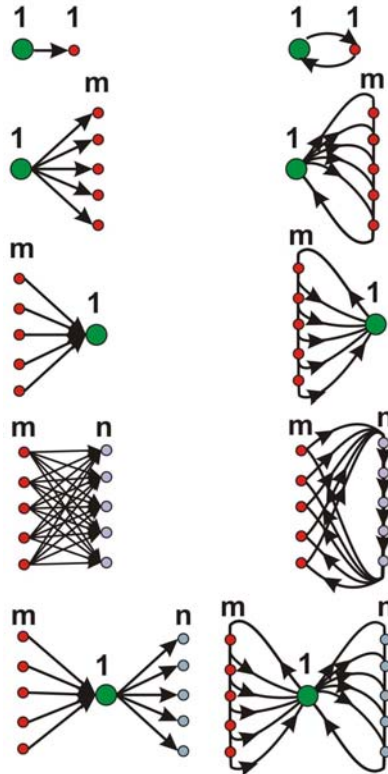


Fig. 5. Linkages, which are generating in distribution process

Linkage type 1-m presents connection of one distribution place on entry with  $m$  distribution places on exit. This type is connection of distribution warehouse with a few consumers, distribution goods. Linkages can be immediate or cyclic.

Linkage type m-1 presents connection  $m$  distribution places on entry and one distribution place on exit. This type is connection a few contractors semi-products on place assembling products or haulage of goods into distribution headquarters. Linkages can be immediate alternatively cyclic.

Linkage type m-n is characteristics for connection  $m$  distribution places on entry and  $n$  distribution places on exit. This type is interconnection a few distribution warehouses with purchasers, consumers. Connection can be immediate from every-one place to everyone purchaser, or cyclic.

Linkage type m-1-n presents interconnection  $m$  places on entry with  $n$  places on exit across one distribution centre. This type is interconnection a few procurers with purchasers across one shared distribution warehouse. Linkages can be immediate

from every distribution place on shared distribution centre or cyclic connection some-one places of entry and someone places of exit across shared distribution centre (Marasová 2009, Balog, Bindzar 2009).

## 5. Conclusion

The classification of distribution networks expressly mention at possibilities connection between producers and consumers. In terms of economy is the best distribution net of point's type. This type of distribution net represents production, sale and usage in one point. In terms of production distribution is this type more hypothetic than real and economical better are distribution networks of type circle and flower.

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