Basic protection/restoration mechanisms and notation

(Pioro - Médhi : 9.1)

- A <u>failure state (scenario)</u> s is a vector of <u>link availability coefficients</u>

$$\alpha^s = (\alpha^s_{(i_1,j_1)}, \alpha^s_{(i_2,j_2)}, \dots \alpha^s_{(i_m,j_m)}) \quad m = |A|$$

where $0 \leq \alpha^s_{(i,j)} \leq 1$ is the proportion of the normal capacity u_{ij} of link (i,j) that is available in scenario s, with $s = 1, \dots S$ <u>predefined list of failure scenarios</u>

- Failure scenario's are also characterized by

$$\chi^s = (\chi^s_{d_1}, \dots \chi^s_{d_{|D|}})$$

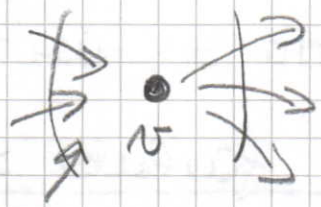
where χ^s_d is the proportion of h_d (= traffic volume of commodity d) that must be realized in scenario s (it may be $\chi^s_d < 1$ meaning decreased realized traffic volume for d under s)

- $s = 0$ will be used to denote the <u>normal state</u> (no failures):

  - $\alpha^{0}_{(i,j)} = 1 \quad \forall (i,j) \in A$
  - $\chi^{0}_{d} = 1 \quad \forall d \in D$

<u>example</u>

- <u>failure of a node v</u>:



$$\alpha^{s}_{(i,v)} = 0 \quad \forall (i,v) \in BS(i)$$

$$\alpha^{s}_{(v,i)} = 0 \quad \forall (v,i) \in FS(i)$$

$$\chi^{s}_{d} = 0 \quad \forall d = (v,t) \text{ or } d = (t,v)$$

- <u>dynamic (multi-hour) networks</u> (no failures):

$$\forall d \in D \quad h^{s}_{d} = \chi^{s}_{d} \cdot h_{d} \qquad s = \overbrace{1,..S}^{\text{time}}$$

gives the traffic volume of d for

different times of the day (i.e. s now denotes time slot) : in this context it may be $X_d^s > 1$ for some s.

- Protection versus restoration ≡ concerns how resources are re-established in case of failure

  - protection : mechanisms to "protect" the network "before" the failure happens
    e.g. path diversity

< these are robust approaches >

  - restoration : mechanisms indicating actions to be performed "after" the failure (to try to re-establish resources)

* The term re-establishment is generally used for both protection and restoration *