Positive Linear System

- At the $(k+1)$th congestion event, source s's window satisfies

$$w_s(k+1) = \beta_s w_s(k) + \left(\frac{\alpha_s}{\sum_{i=1}^{n} \alpha_i} \right) \sum_{i=1}^{n} (1-\beta_i)\, w_i(k).$$

Let $w(k) = (w_1(k), \ldots, w_n(k))^T$ and write a positive system:

$$w(k+1) = Aw(k),$$

where

$$A = \begin{bmatrix} \beta_1 & 0 & \cdots & 0 \\ 0 & \beta_2 & 0 & 0 \\ \vdots & 0 & \ddots & 0 \\ 0 & 0 & \cdots & \beta_n \end{bmatrix} + \frac{1}{\sum_{i=1}^{n} \alpha_i} \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \cdots \\ \alpha_n \end{pmatrix} (1-\beta_1, \cdots, 1-\beta_n)$$