Network Protection through Insurance: Premium Computation for the ON-OFF Service Model

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The risk of SLA commitments

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Can the network provider protect itself through insurance ?

How much should it pay for insurance ?

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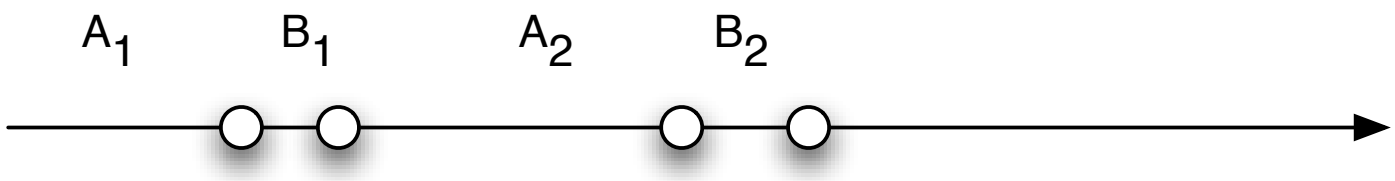

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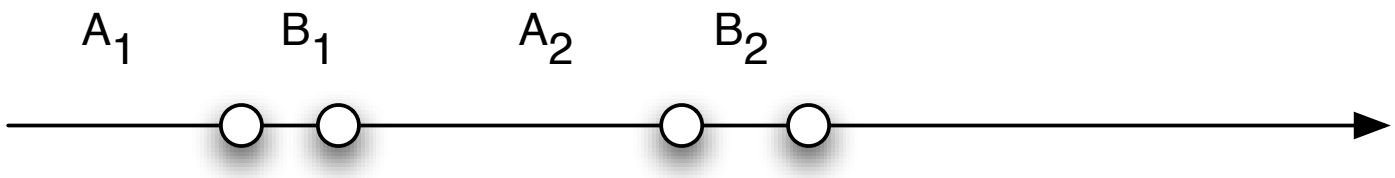

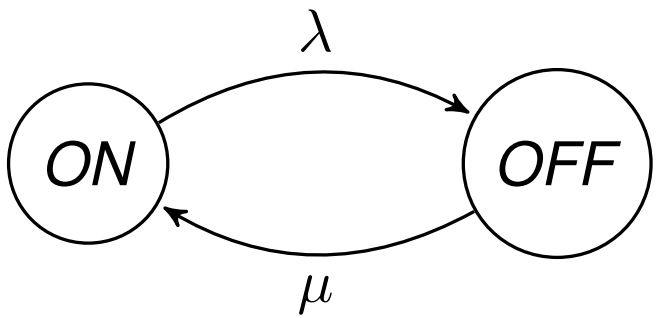

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Compensation is proportional to a quality metric

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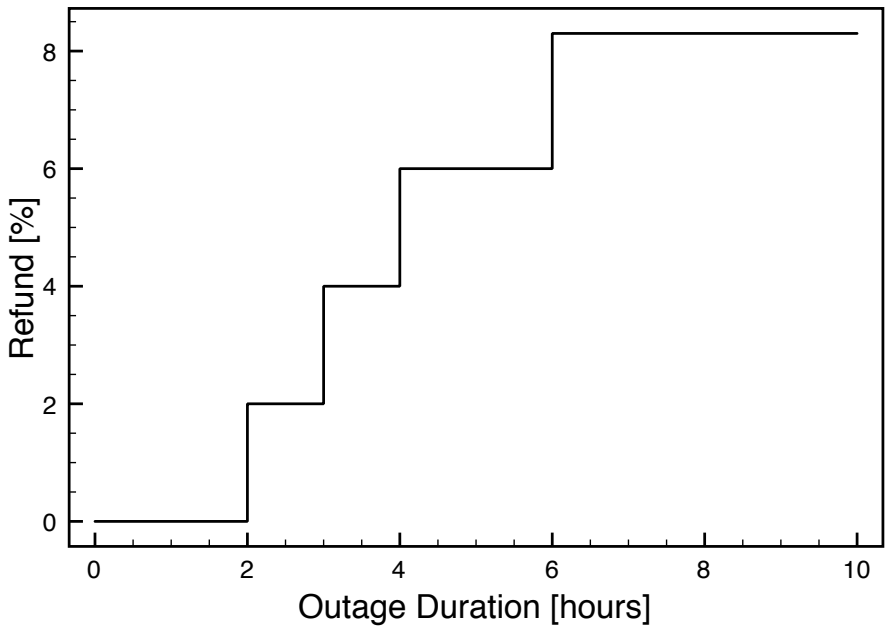

Economical loss

Economical loss

Assumption: the duration of failures is negligible with respect to the working times

Quality Metric	Loss	Avg	Variance
Failures	$k_{\mathrm{f}} N_T$	$k_{\mathrm{f}} \lambda T$	$k_{\mathrm{f}}^2 \lambda T$
Long outages	$k_{\mathrm{lf}} \sum_{i=0}^{N_T} \mathrm{I}_{[B_i > W]}$	$k_{\mathrm{lf}} \lambda T e^{-\mu W}$	$k_{\mathrm{lf}}^2 \lambda T e^{-\mu W}$
Unavailability	$k_{\mathrm{u}} \sum_{i=1}^{N_T} B_i$	$k_{\mathrm{u}} \frac{\lambda T}{\mu}$	$2 k_{\mathrm{u}}^2 \frac{\lambda T}{\mu^2}$

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The expected utility approach

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The solution is

$$P^+ \simeq \mathbb{E}[X] + \frac{\mathbb{V}[X]}{2} r(\omega - \mathbb{E}[X])$$

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Quality Metric	Premium
Failures	$P_{\mathrm{f}}^{+} = k_{\mathrm{f}} \frac{T}{\mathrm{MTTR}} \frac{1-\Phi}{\Phi} \left(1 + \frac{\alpha}{2} k_{\mathrm{f}}\right)$
Long outages	$P_{\mathrm{lf}}^{+} = k_{\mathrm{lf}} \frac{T}{\mathrm{MTTR}} \frac{1-\Phi}{\Phi} e^{-\mu W} \left(1 + \frac{\alpha}{2} k_{\mathrm{lf}}\right)$
Unavailability	$P_{\mathrm{u}}^{+} = k_{\mathrm{u}} \frac{1-\Phi}{\Phi} T \left(1 + \alpha k_{\mathrm{u}} \mathrm{MTTR}\right)$

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- Unit loss per hour = 1% of the annual revenues
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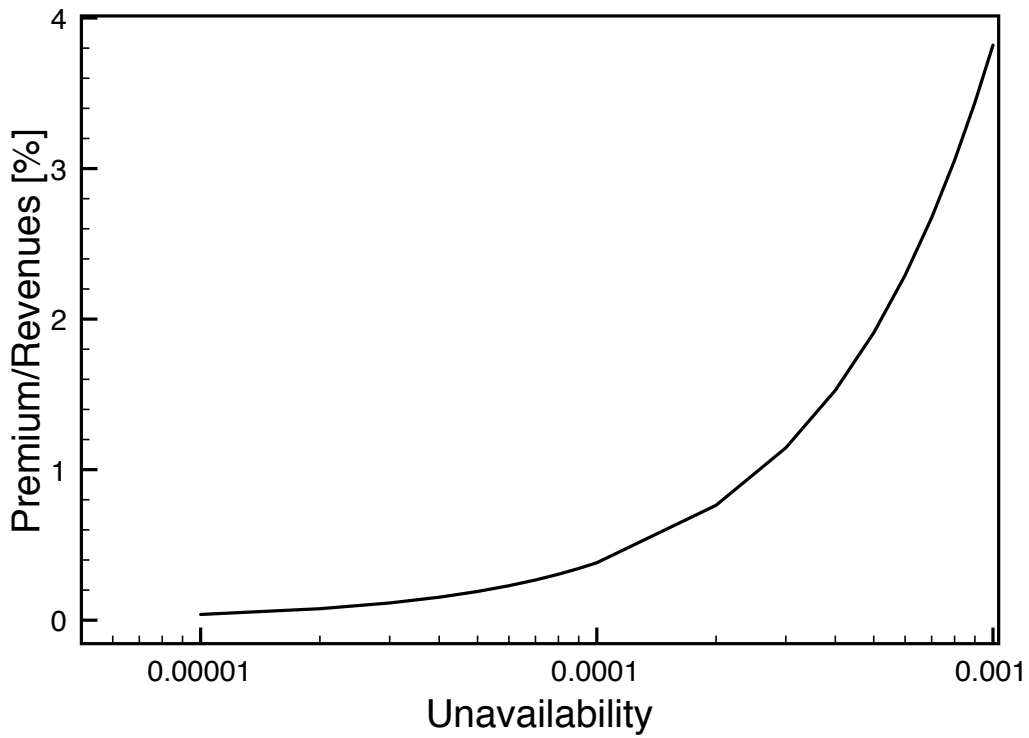

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Network insurance is viable and should be considered as an additional device to reduce risk