

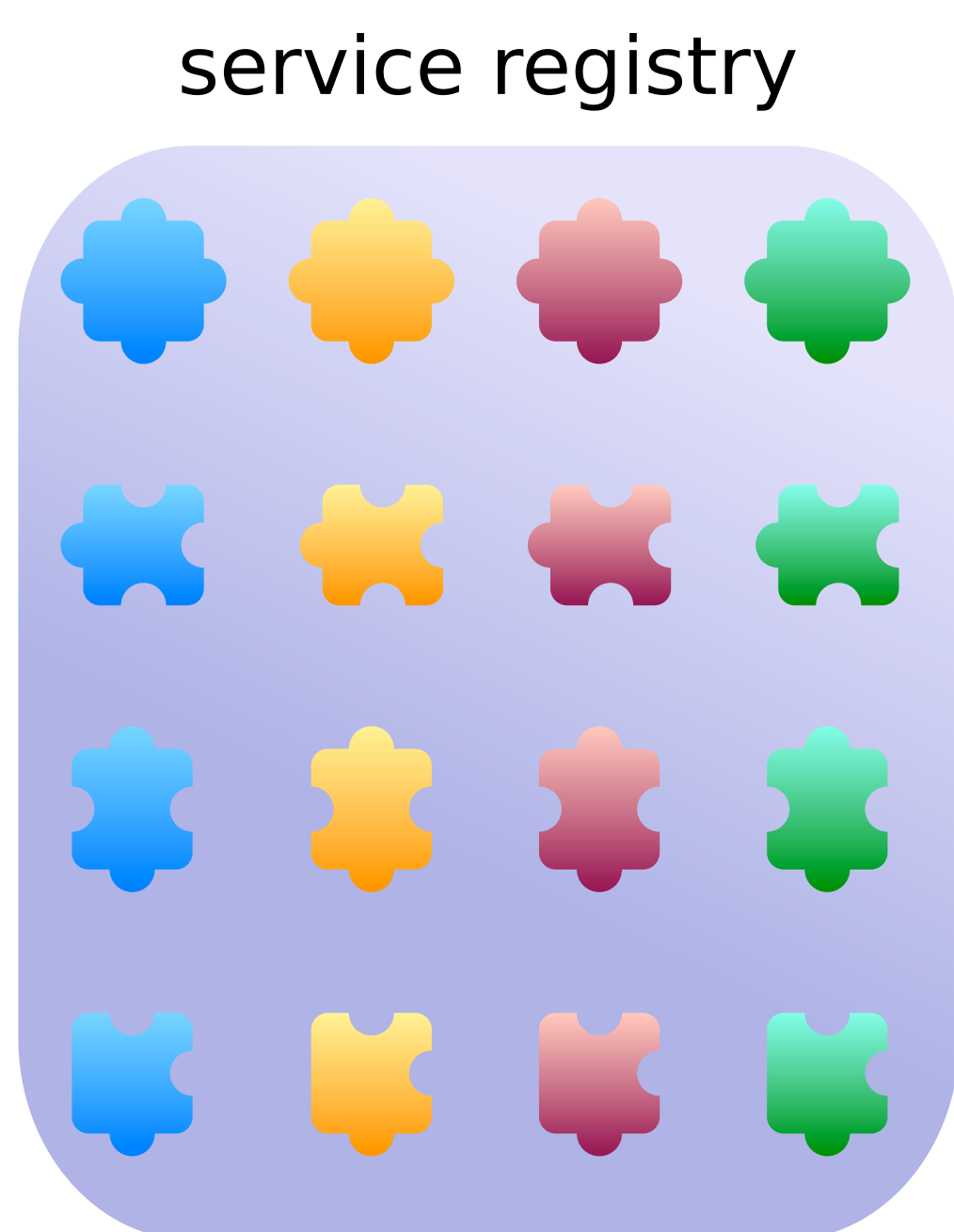
a Pro-active Reputation Management Infrastructure for Composite Web Services

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Motivations and Idea

Open World software

- dynamically changing environment
- new services may become available
- previously available services may disappear
- 3rd-party services may fail...
... but service integrators should guarantee the QoS of their services

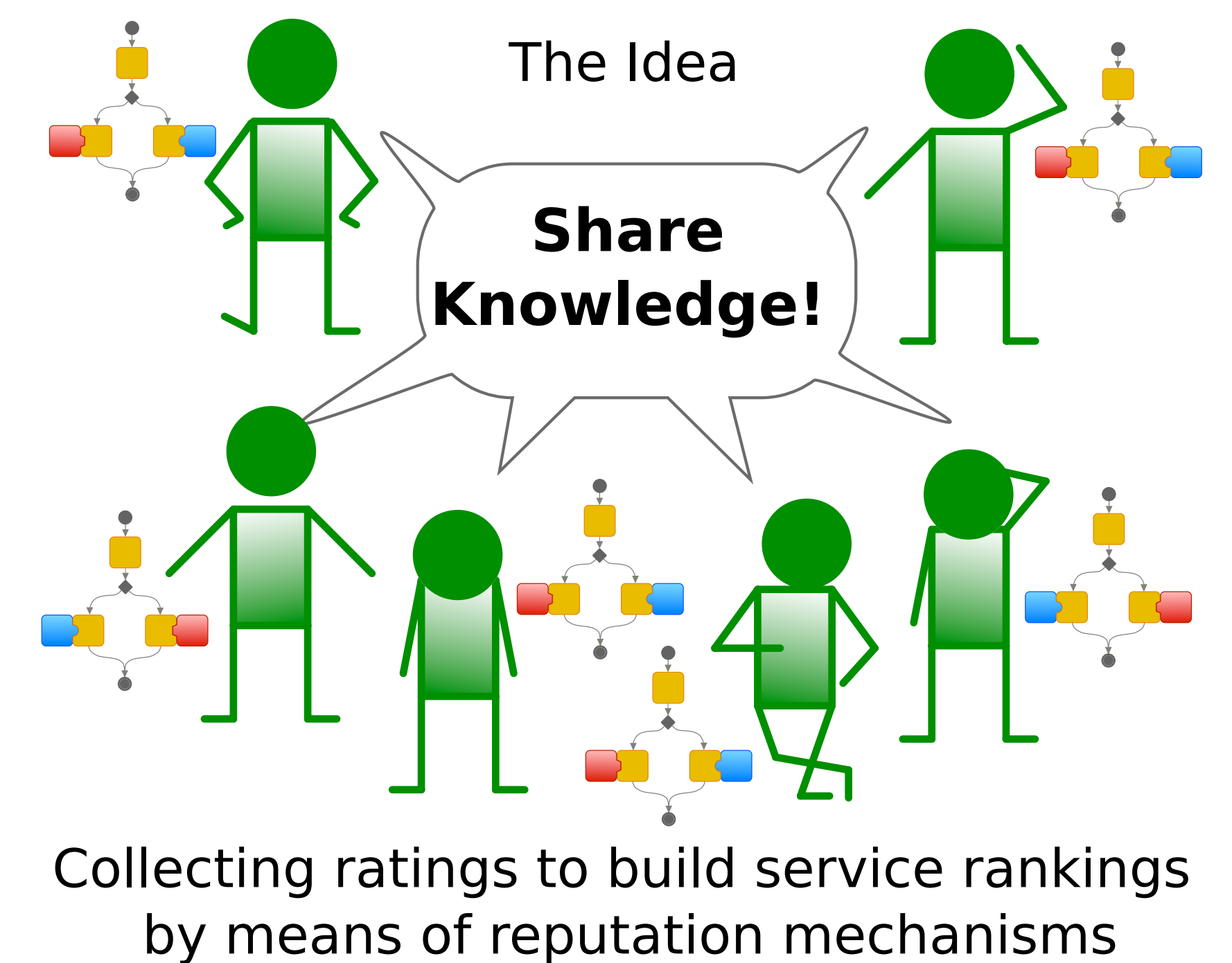
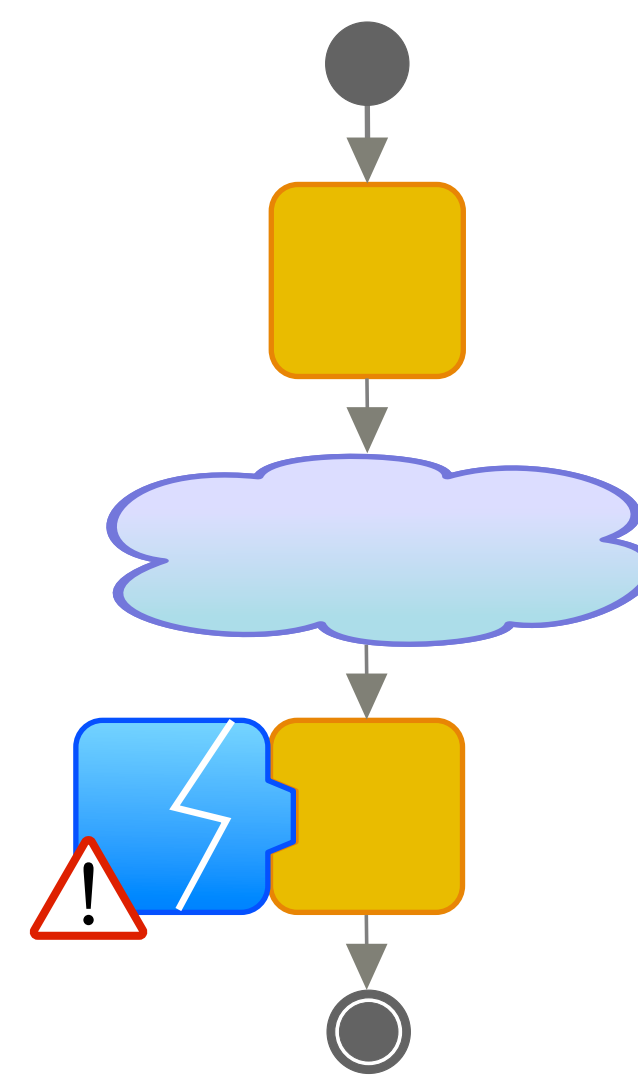


How to replace faulty services?

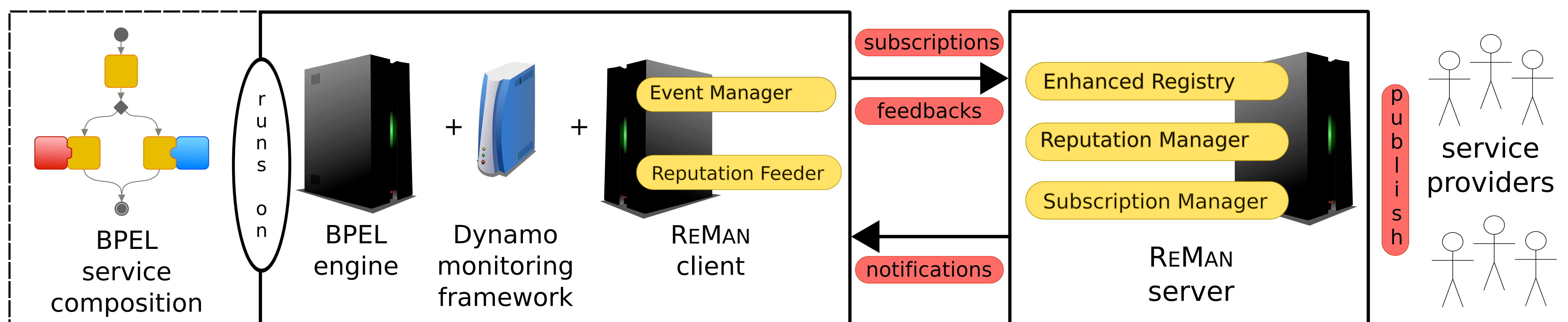


How to prevent service failures?

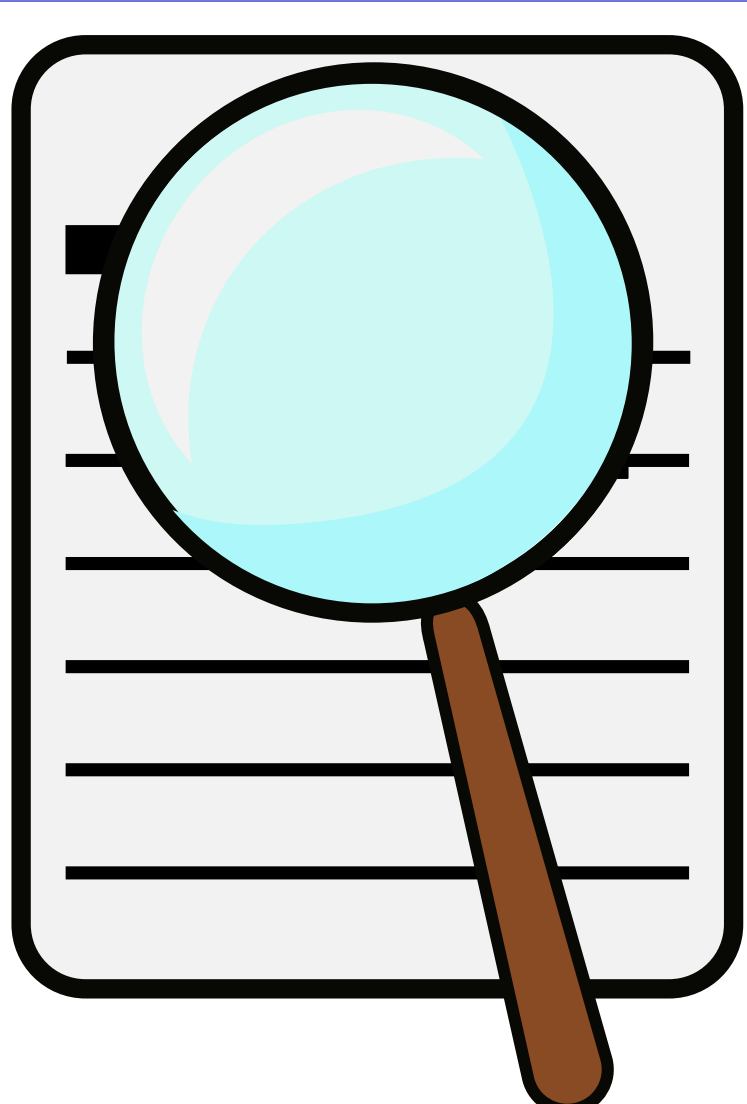
service composition



Architecture



Monitoring



Workflow execution and interactions with external services are monitored by clients at run time to check for :

- Functional Properties (WS-Col)

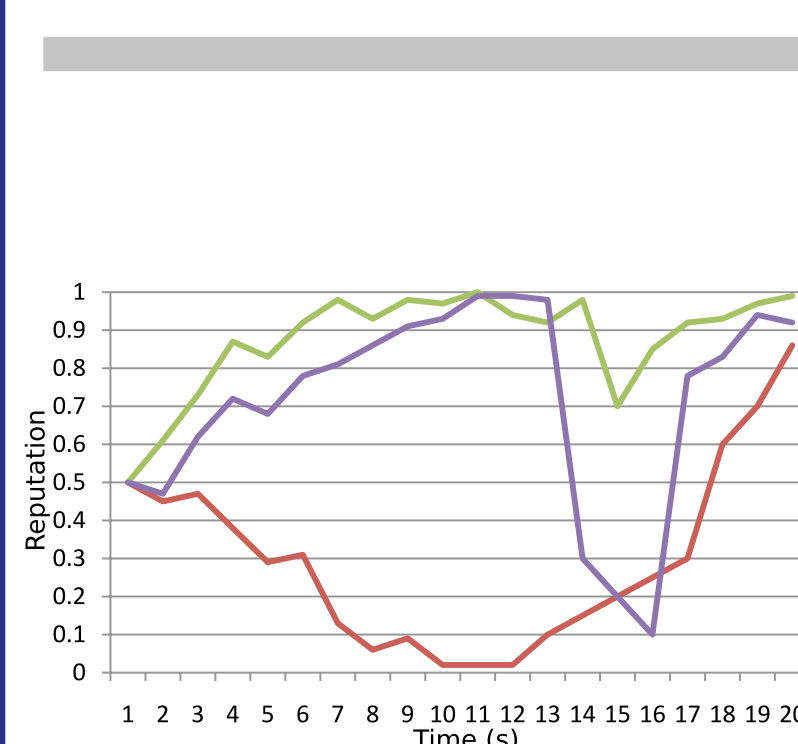

```
@/process/flow/invoke[name='assess'] :
  pre --> true
  post --> ($request/amount > 10000 =>
    $approvalInfo/accept == 'false')
```
- Functional and Non-functional Properties (Albert)


```
avg(elapsed(onEvent(start_assess),
  onEvent(end_assess)), 1h) <= 5s
```

- The result of the evaluation is shared with the other clients by sending a report to the Reputation Manager

Ranking

Bayesian Reputation System



x_i = the i -th report (binary)

$H_n = \{x_1, \dots, x_n\}$, history of the reports

$p = \sum_{i=1}^n x_i$, number of endorsements

$\hat{\theta}$ = estimator of the endorsements refusals ratio

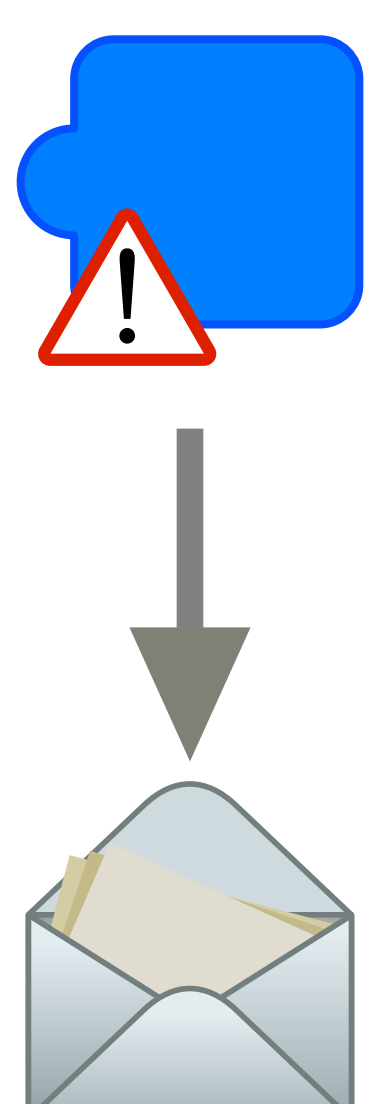
c_1, c_2 = prior knowledge about the distribution

$\rho_{\text{Bayes}} = P(X_{n+1} = 1 | H_n) = E[\hat{\theta} | H_n]$

$\hat{\theta}_{\text{MLE}} \sim \text{Beta}(c_1 + p, c_2 + n - p)$

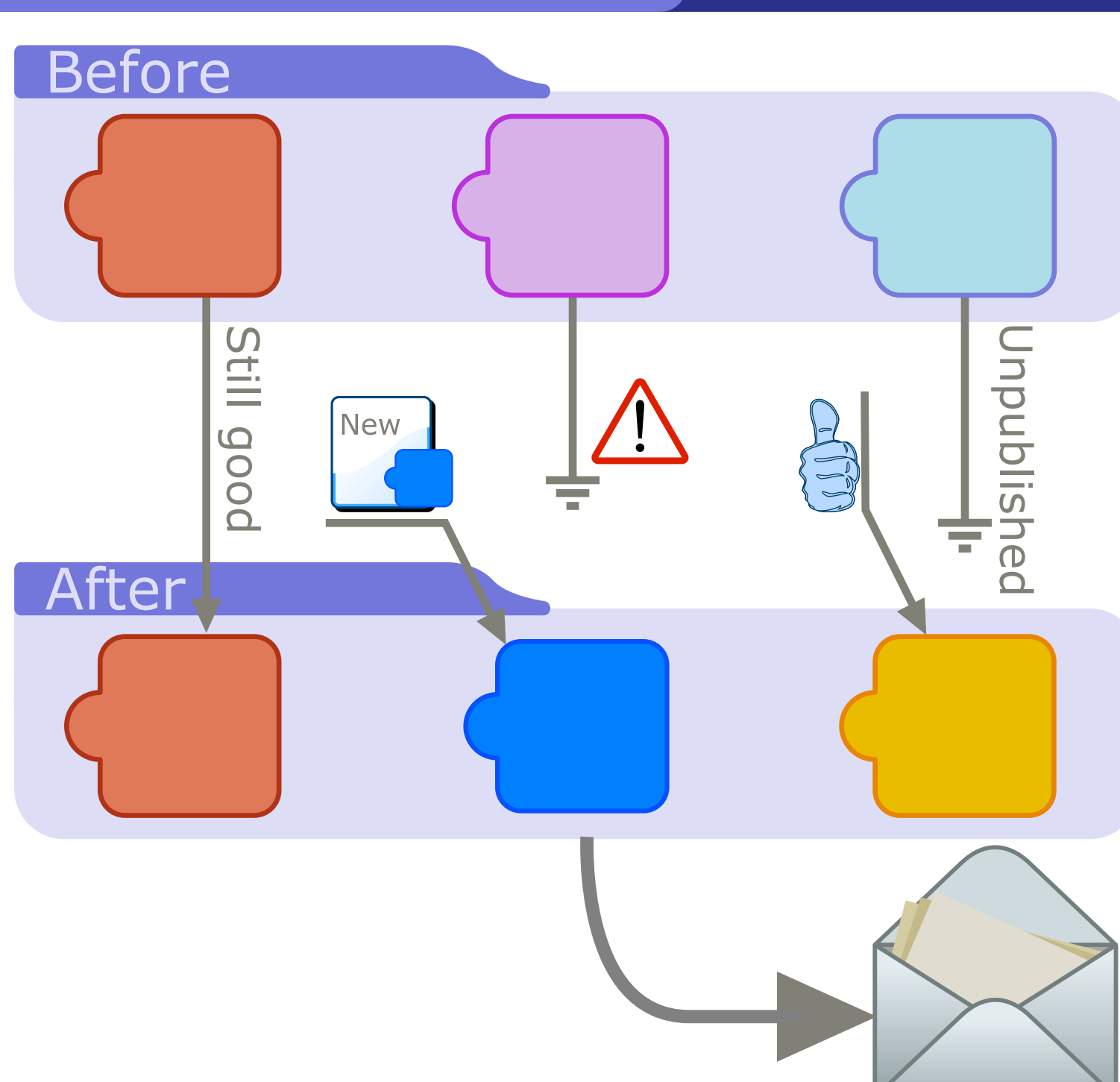
$$\rho_{\text{Bayes}} = \frac{c_1 + p}{c_1 + c_2 + n}$$

Notifications



- Service clients may subscribe to reputation-related events of the services they use
- When the reputation of a service falls below the threshold specified by each client during the subscription, an event is sent to notify the possible failure

- Clients may then trigger recovery actions (e.g., rebinding to another service)



- Services are clustered by the Reputation Manager on the basis of their interface (WSDL)
- Service clients may declare their interest in a particular cluster (a specific type of services) through the subscription mechanism
- For each cluster, the set of the best services is computed and kept up to date when:
 - Services are published or removed
 - The reputation of a service falls down
 - The reputation of a service grows
- When a change in this set is detected, interested clients are notified