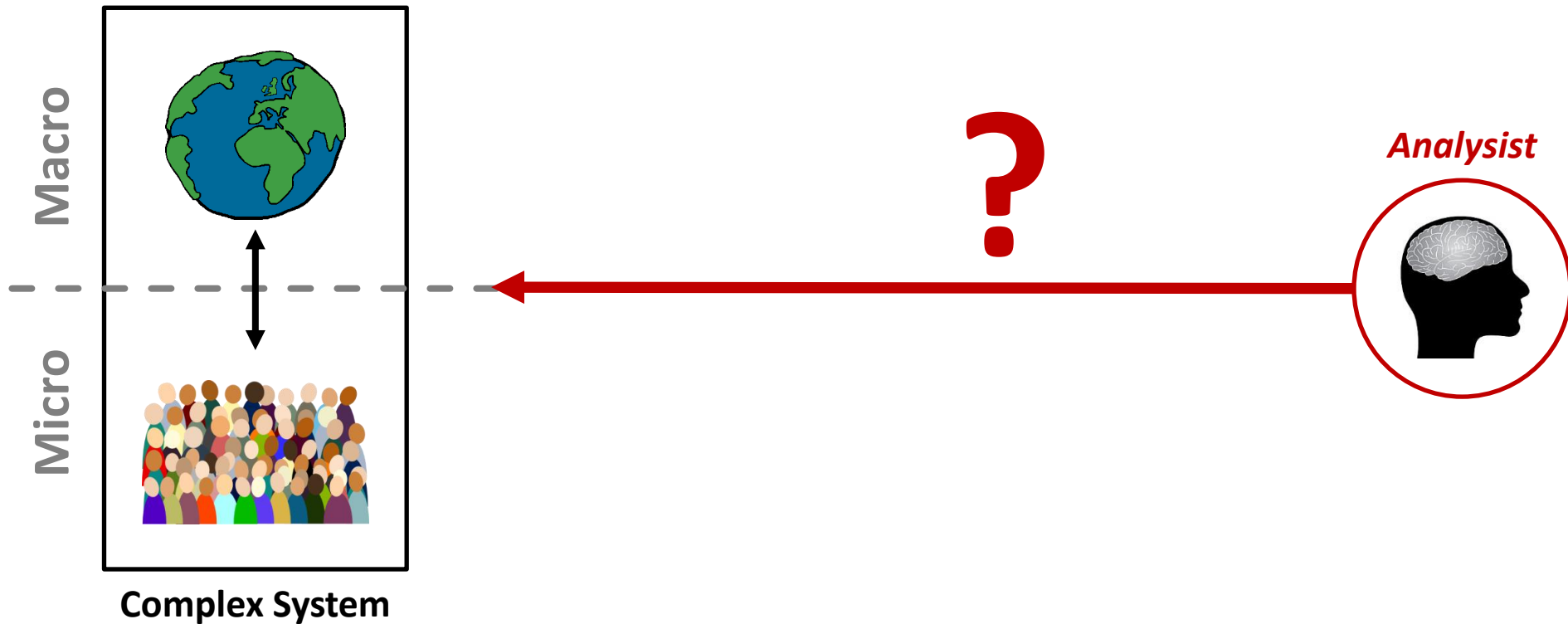


Data Aggregation for Complex Systems Analysis

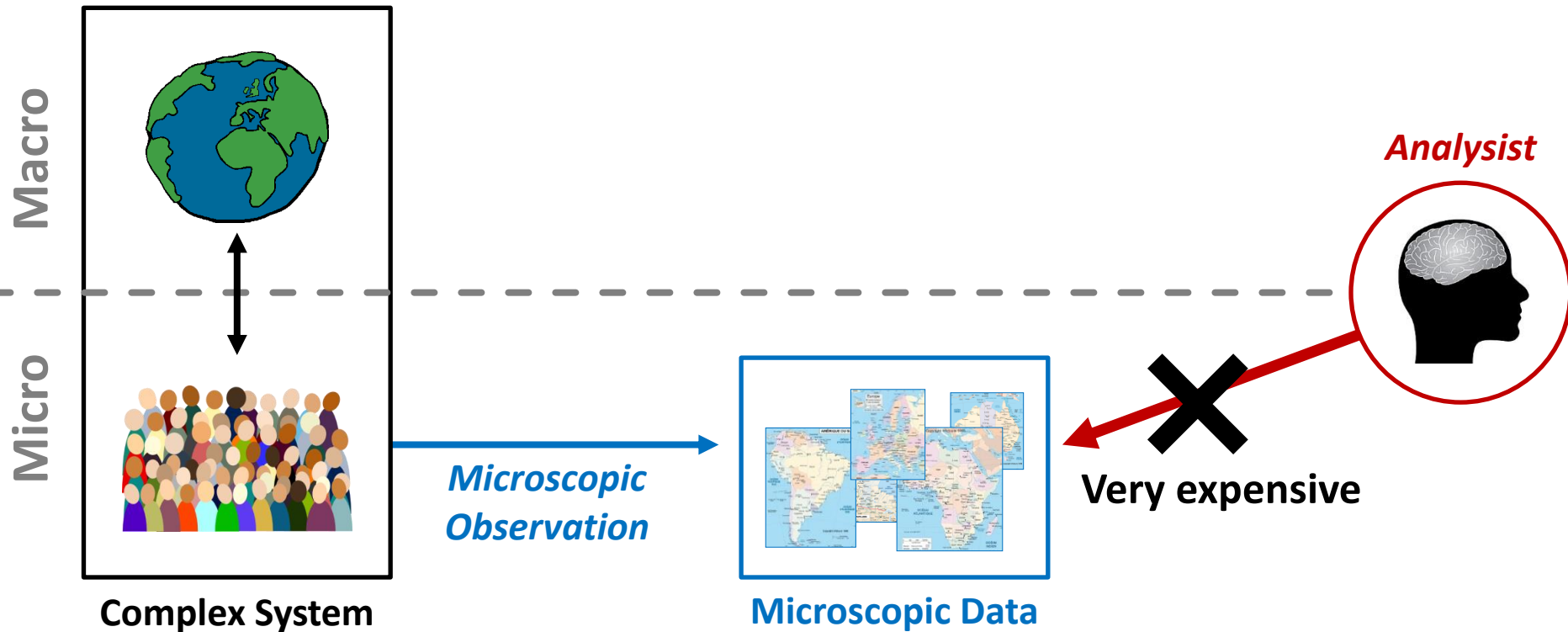
Robin Lamarche-Perrin, Yves Demazeau & Jean-Marc Vincent

LABORATOIRE D'INFORMATIQUE DE GRENOBLE, FRANCE
(Computer Science Laboratory of Grenoble, France)

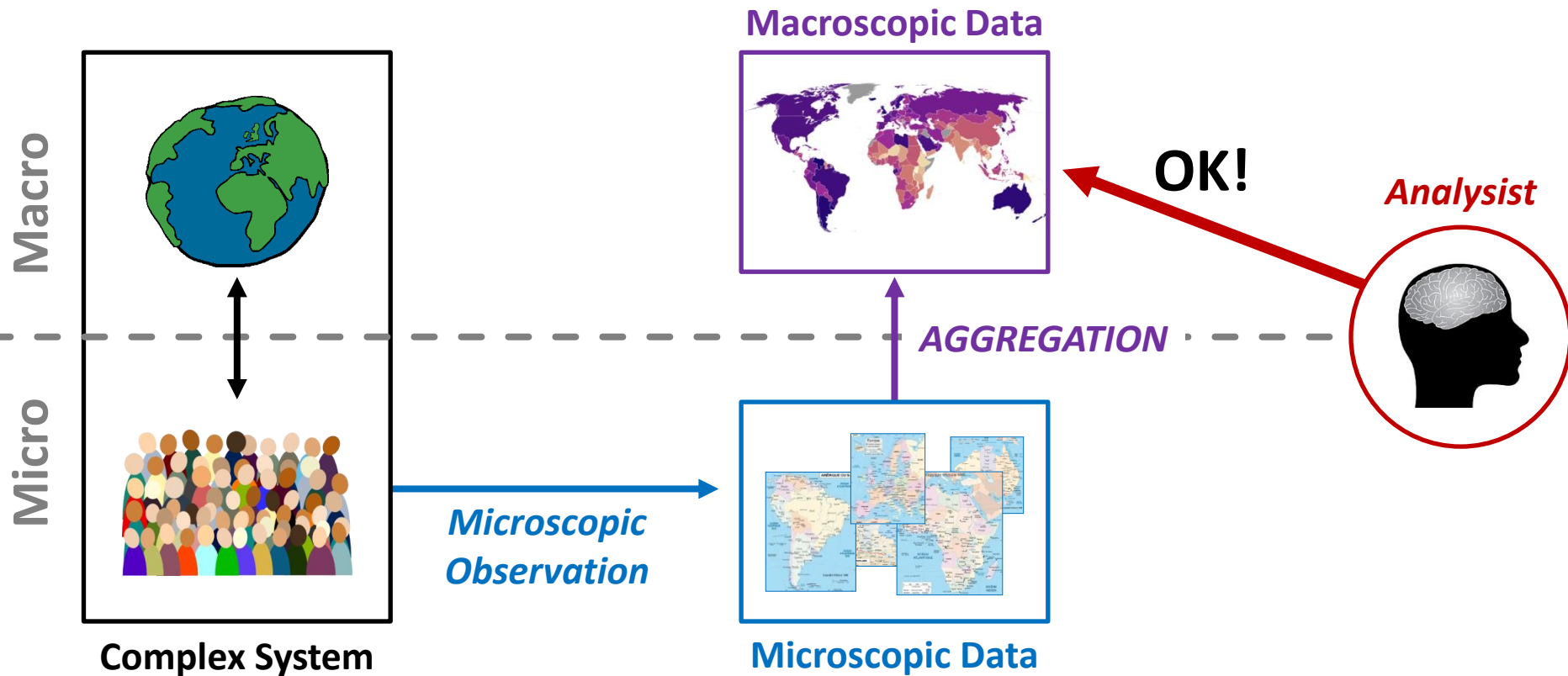
Moving the Analysis Level



Moving the Analysis Level



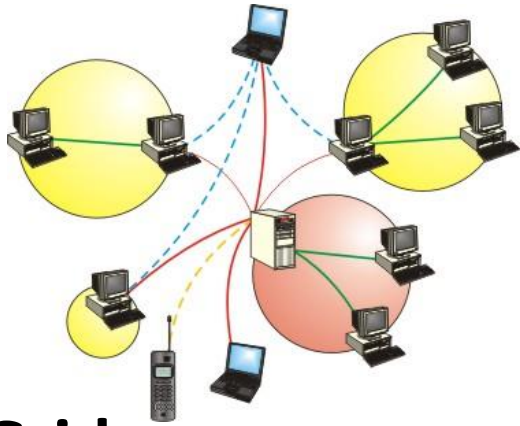
Moving the Analysis Level



AGGREGATED VISUALIZATION FOR GRID COMPUTING ANALYSIS

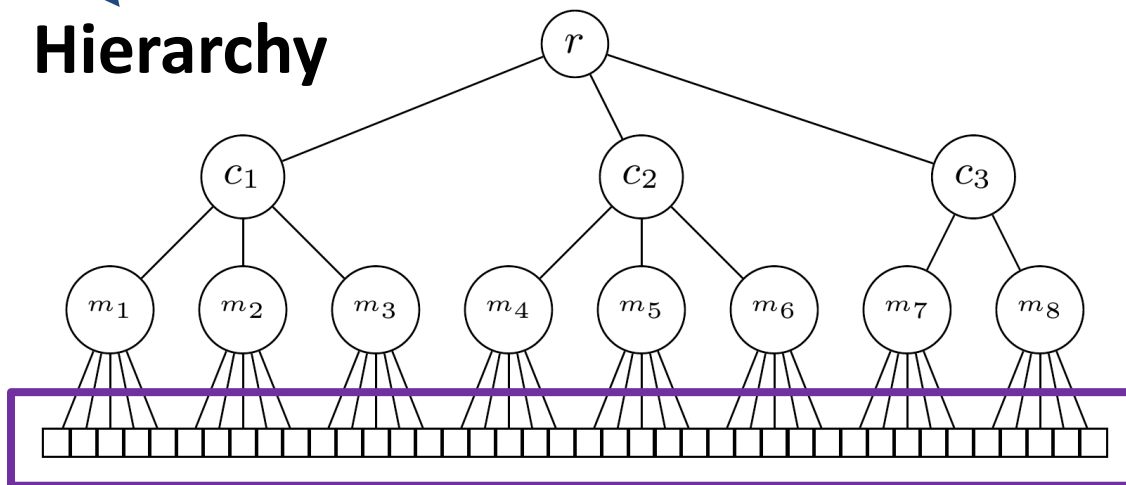
TRIVA Project - ANR SONGS

Visualization of Distributed Systems

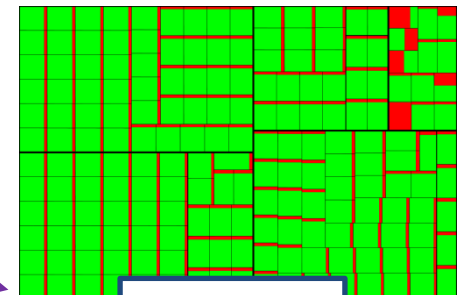


Grid

Hierarchy



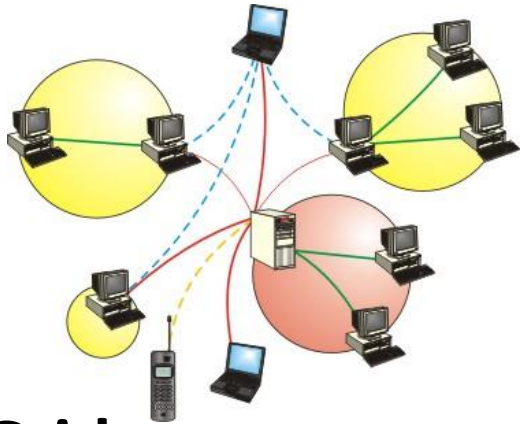
Treemap



Processes

TRIVA Project - ANR SONGS

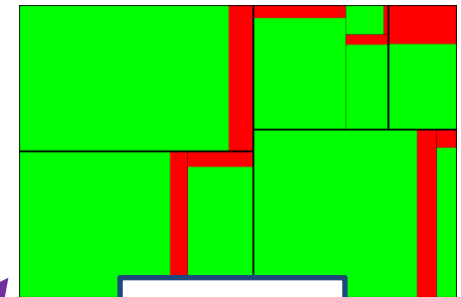
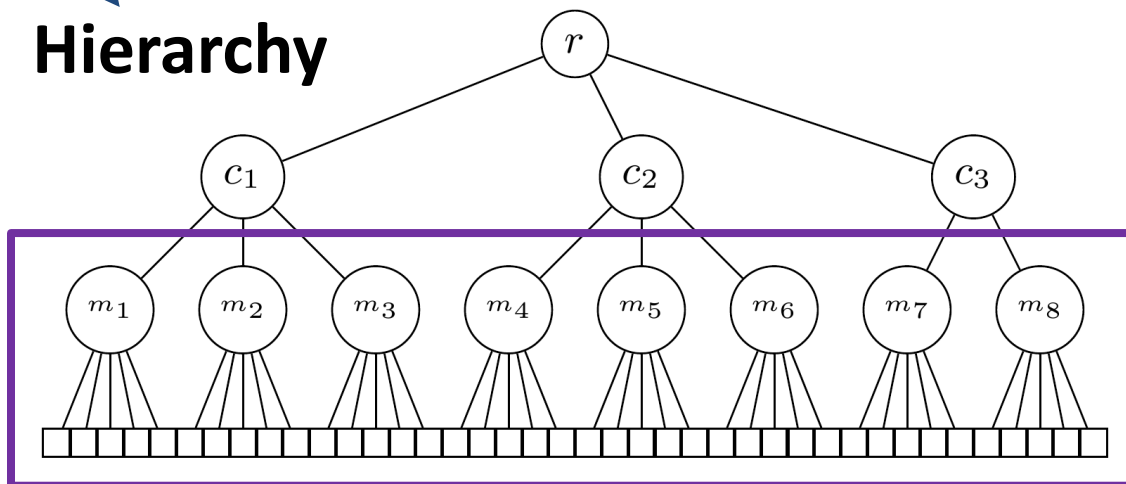
Visualization of Distributed Systems



Grid



Hierarchy



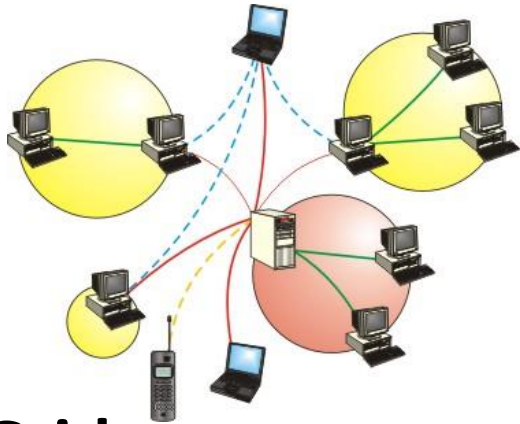
Machines



Processes

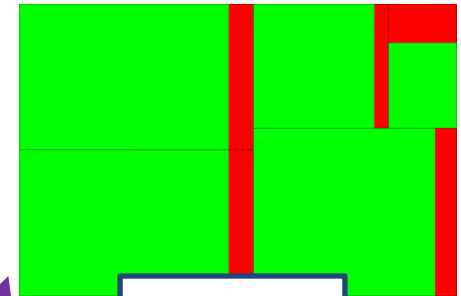
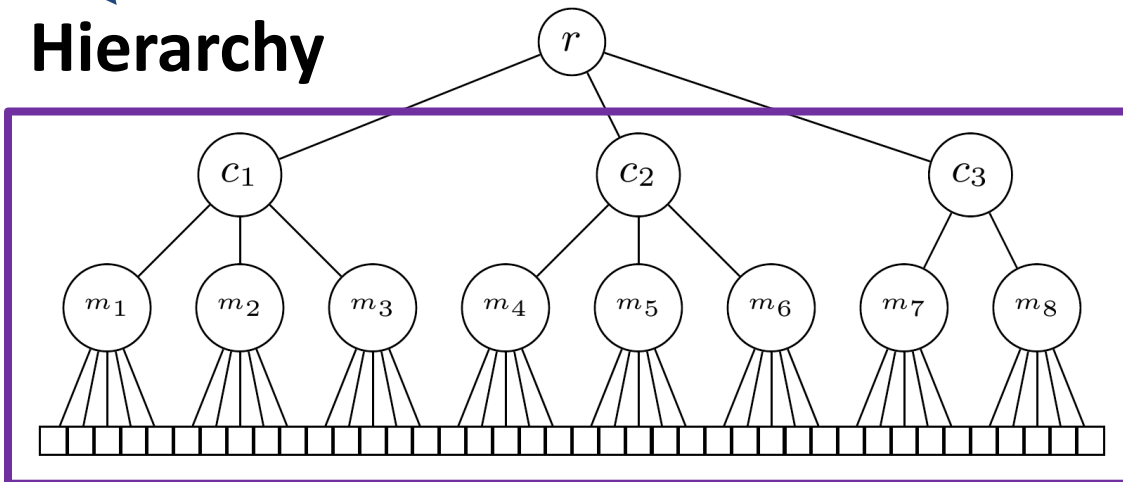
TRIVA Project - ANR SONGS

Visualization of Distributed Systems

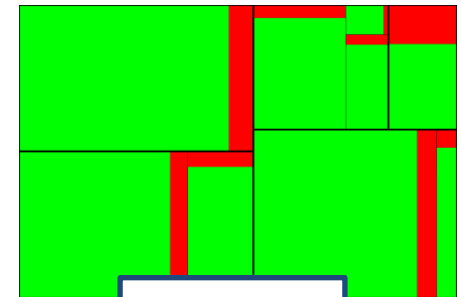


Grid

Hierarchy



Clusters



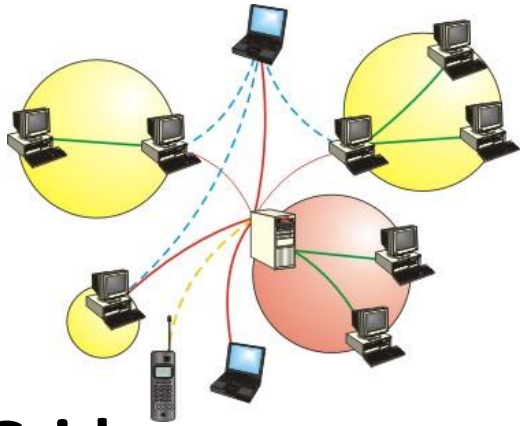
Machines



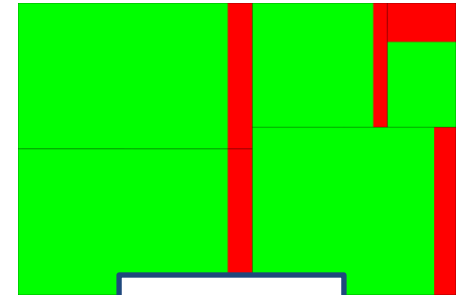
Processes

TRIVA Project - ANR SONGS

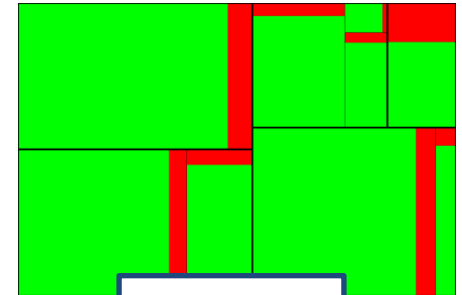
Visualization of Distributed Systems



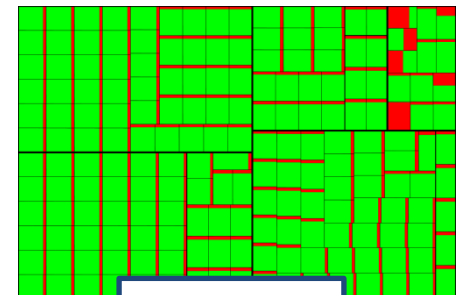
System



Clusters

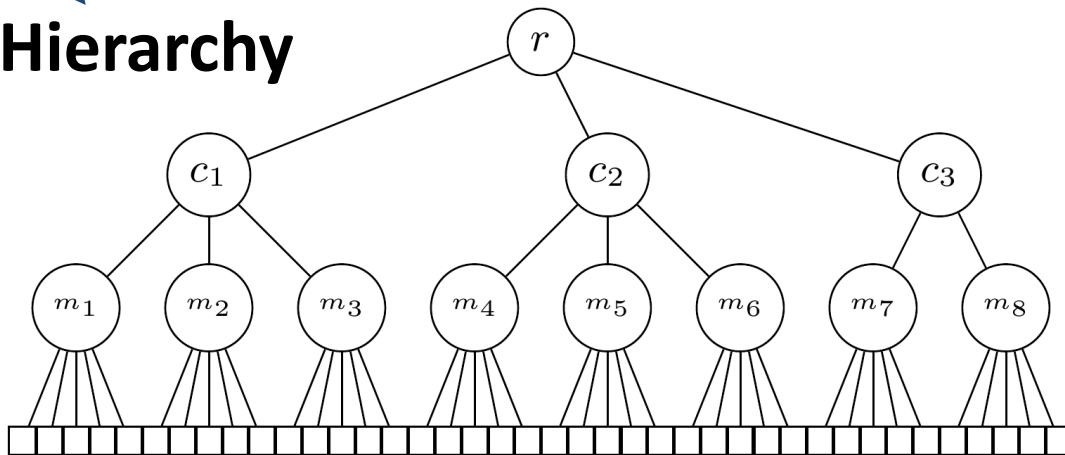


Machines



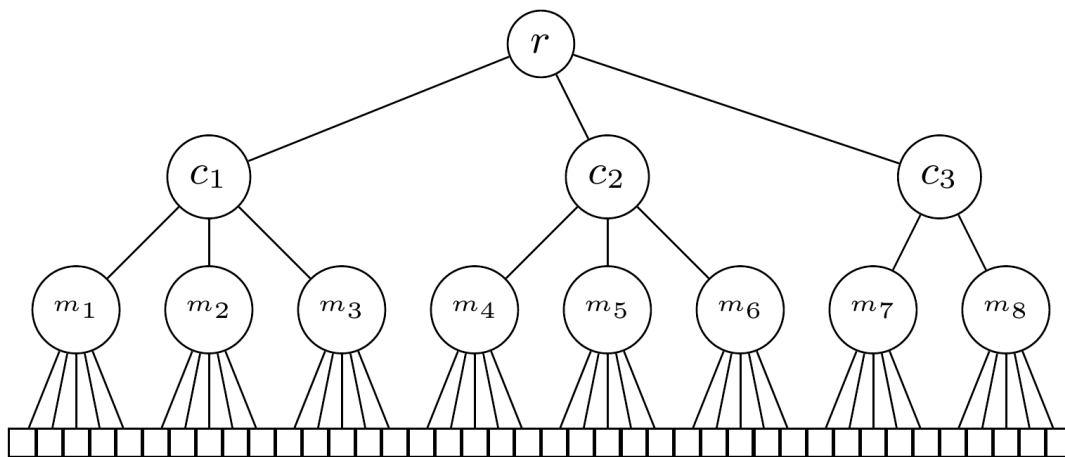
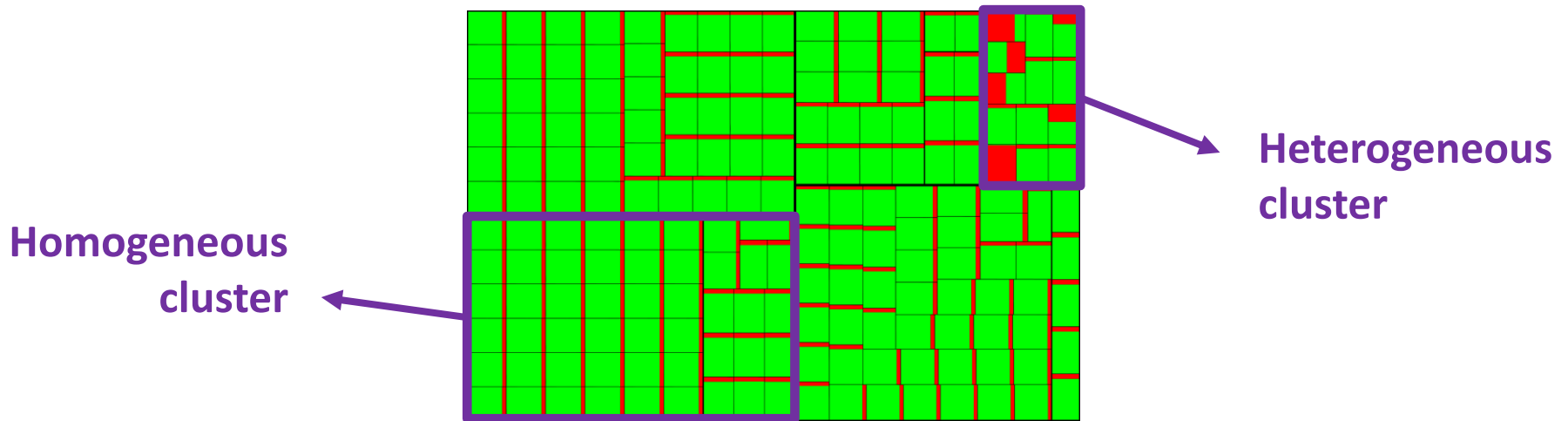
Processes

Hierarchy



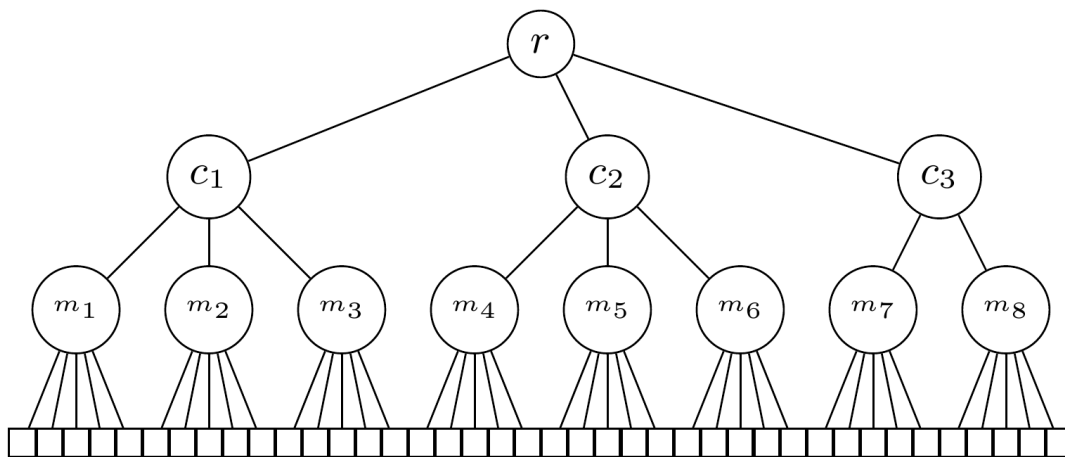
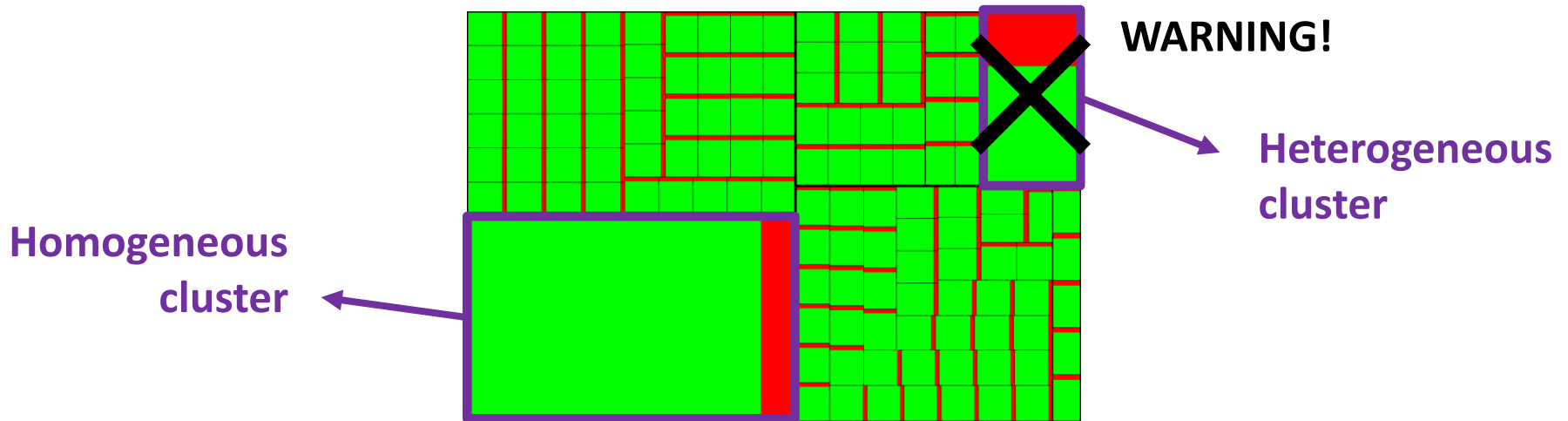
TRIVA Project - ANR SONGS

Visualization of Distributed Systems



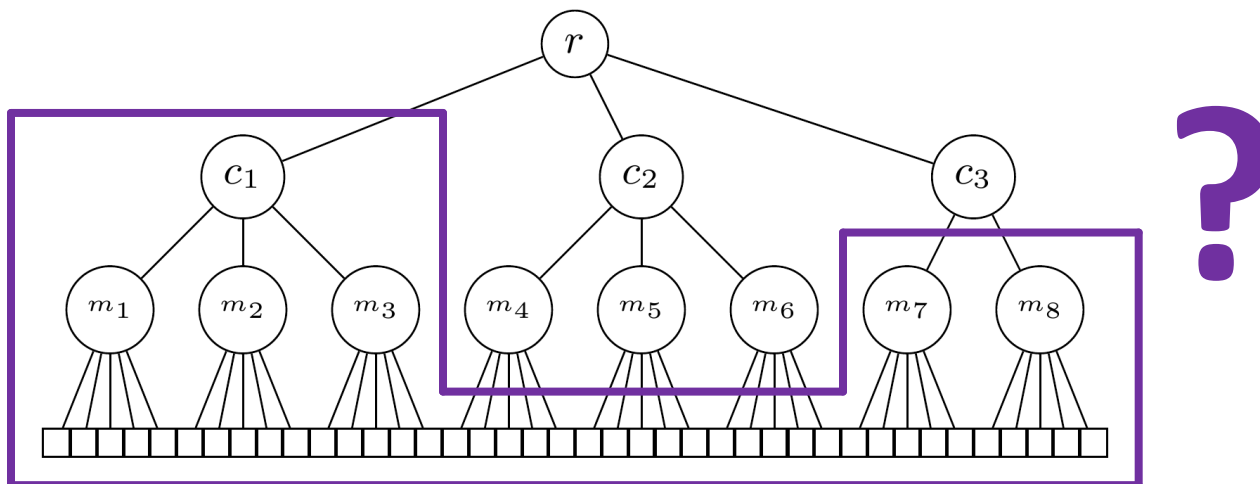
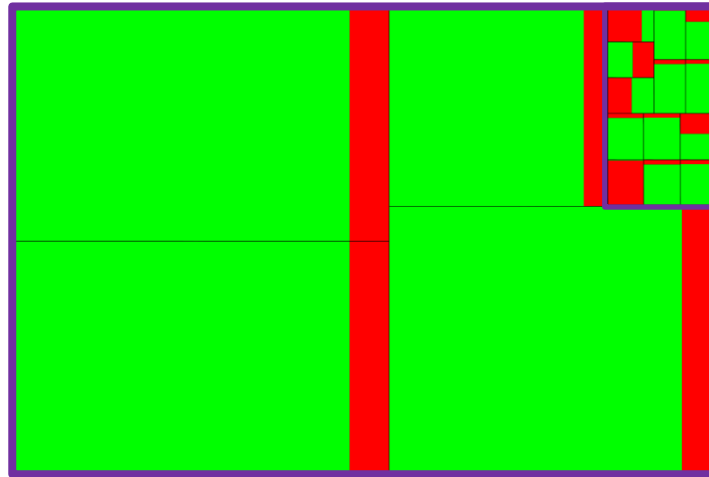
TRIVA Project - ANR SONGS

Visualization of Distributed Systems



TRIVA Project - ANR SONGS

Visualization of Distributed Systems



EVALUATION OF AGGREGATIONS

Information-Theoretic Measures

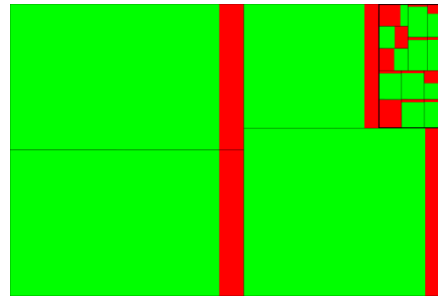
Microscopic
Data

Aggregation

Macroscopic
Data



$p(x)$



$p(y)$

**What do we gain?
What do we lose?**

Information Theory

Shannon Entropy

$$H = - \sum_x p(x) \log_2(p(x))$$

Kullback-Leibler Divergence

$$D = - \sum_x p(x) \log_2 \left(\frac{p(y)}{p(x)|y|} \right)$$

Information Criterion

$$C_p = pG - (1 - p)D$$

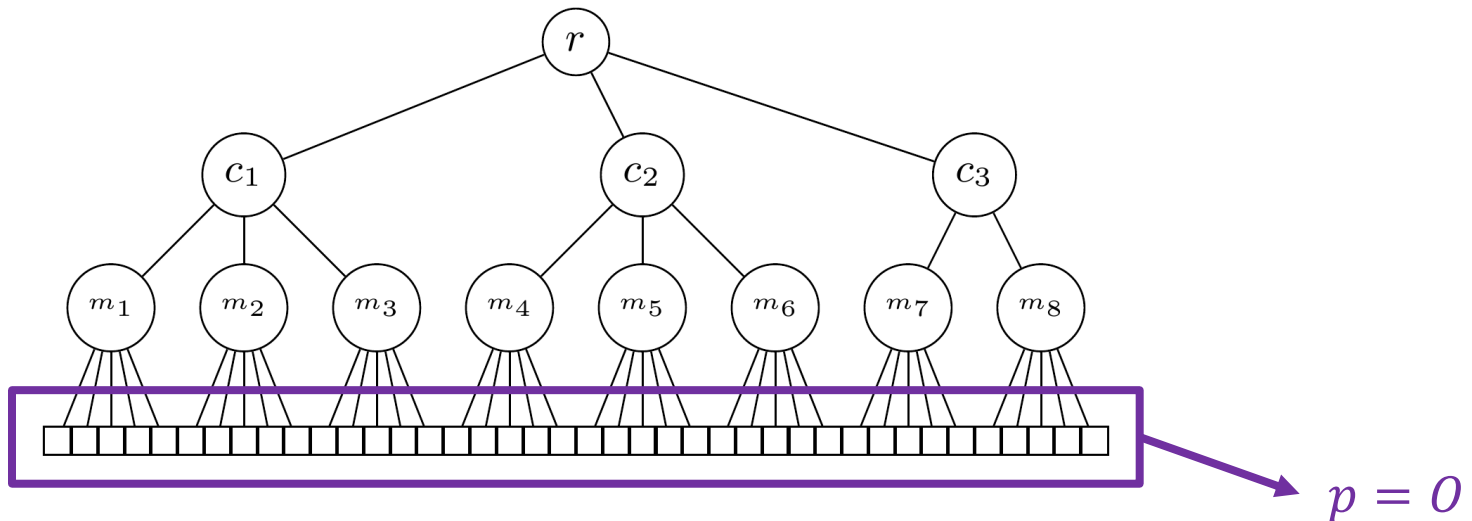
A Trade-Off between Gain and Loss

Maximizing the criterion

$$C_p = \underline{p} \times G - \underline{(1 - p)} \times L$$

Complexity Gain vs. Information Loss

Parameter

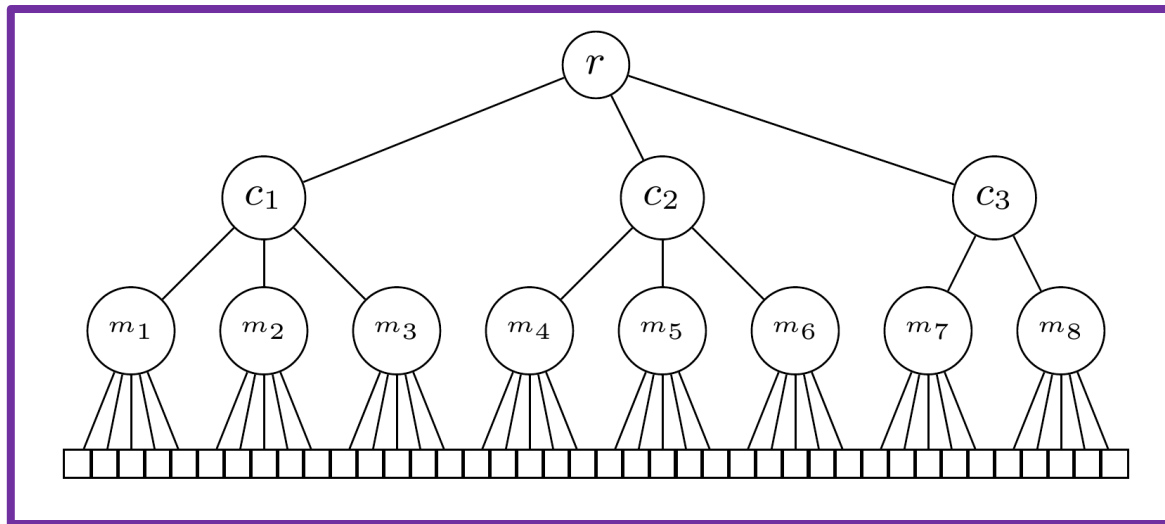


A Trade-Off between Gain and Loss

Maximizing the criterion

$$C_p = \underbrace{p}_{\text{Parameter}} \times \underbrace{G}_{\text{Complexity Gain}} - \underbrace{(1 - p)}_{\text{Parameter}} \times \underbrace{L}_{\text{Information Loss}}$$

Complexity Gain vs. Information Loss



$p = 1$

$p = 0$

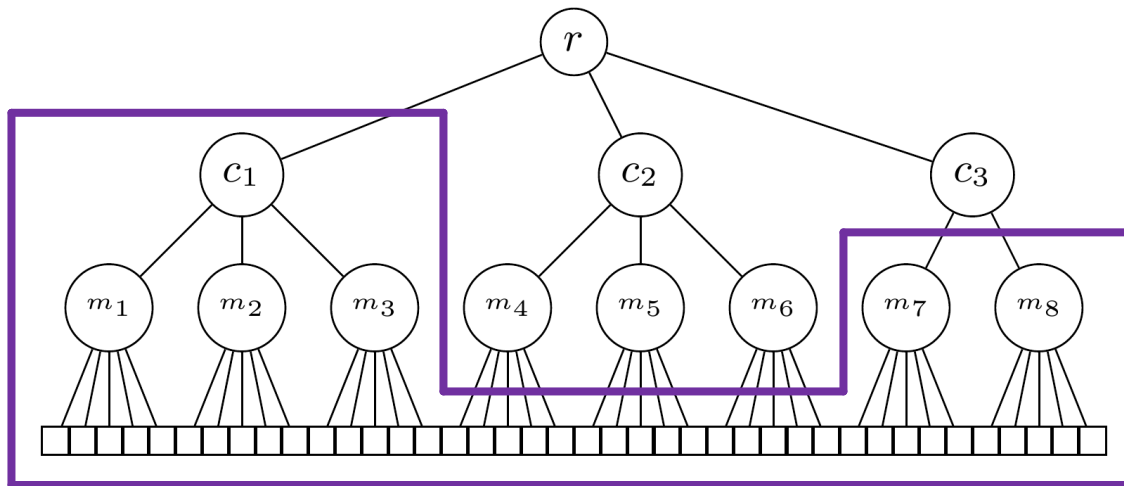
A Trade-Off between Gain and Loss

Maximizing the criterion

$$C_p = \underline{p} \times G - \underline{(1 - p)} \times L$$

Complexity Gain vs. Information Loss

Parameter



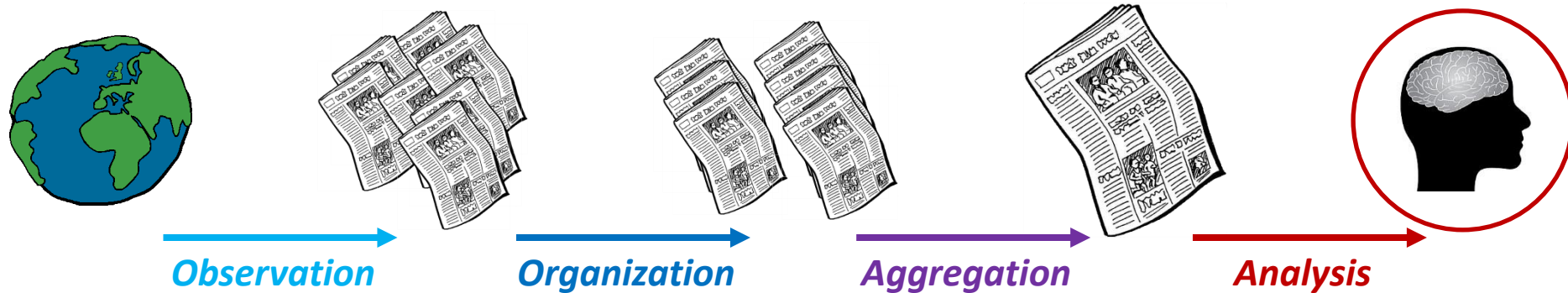
$p = 1$

$p = 0$

SPATIAL AGGREGATION OF MEDIA INFORMATION

GEOMEDIA Project

Spatial Aggregation of Media Information

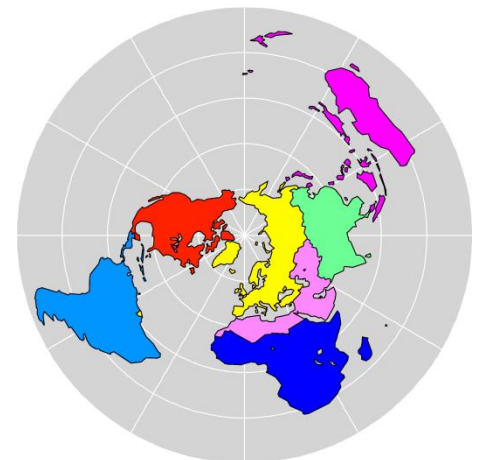


**Which aggregation is
the most efficient?**

| | USA | France | Libye | Israël | Syrie | Palestine | Afghanistan | ... | Total |
|-------------|-----|--------|-------|--------|-------|-----------|-------------|-----|-------|
| USA | x | 25 | 19 | 18 | 24 | 24 | 24 | ... | 423 |
| France | 25 | x | 36 | 10 | 15 | 15 | 30 | ... | 248 |
| Libye | 19 | 36 | x | 0 | 7 | 0 | 2 | ... | 308 |
| Israël | 18 | 10 | 0 | x | 4 | 62 | 0 | ... | 153 |
| Syrie | 24 | 15 | 7 | 4 | x | 1 | 0 | ... | 260 |
| Palestine | 24 | 15 | 0 | 62 | 1 | x | 0 | ... | 126 |
| Afghanistan | 24 | 30 | 2 | 0 | 0 | 0 | x | ... | 131 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Total | 423 | 248 | 308 | 153 | 260 | 126 | 131 | ... | 3520 |



UNEP

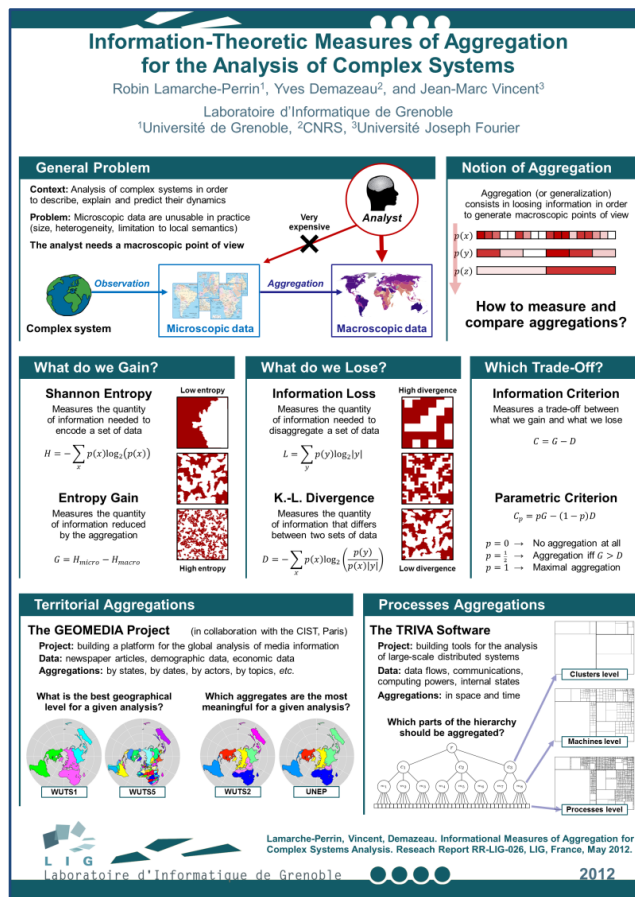


WUTS2

Thank you for your attention

Session B (Tuesday) Poster 18

Robin.Lamarche-Perrin@imag.fr



Lamarche-Perrin, Vincent and Demazeau. Informational Measures of Aggregation for Complex Systems Analysis. Research report RR-LIG-026, *Laboratoire d'Informatique de Grenoble, France*, May 2012.

Lamarche-Perrin, Demazeau and Vincent. Macroscopic Observation of Multiagent Systems. Research report RR-LIG-010, *Laboratoire d'Informatique de Grenoble, France*, March 2011.