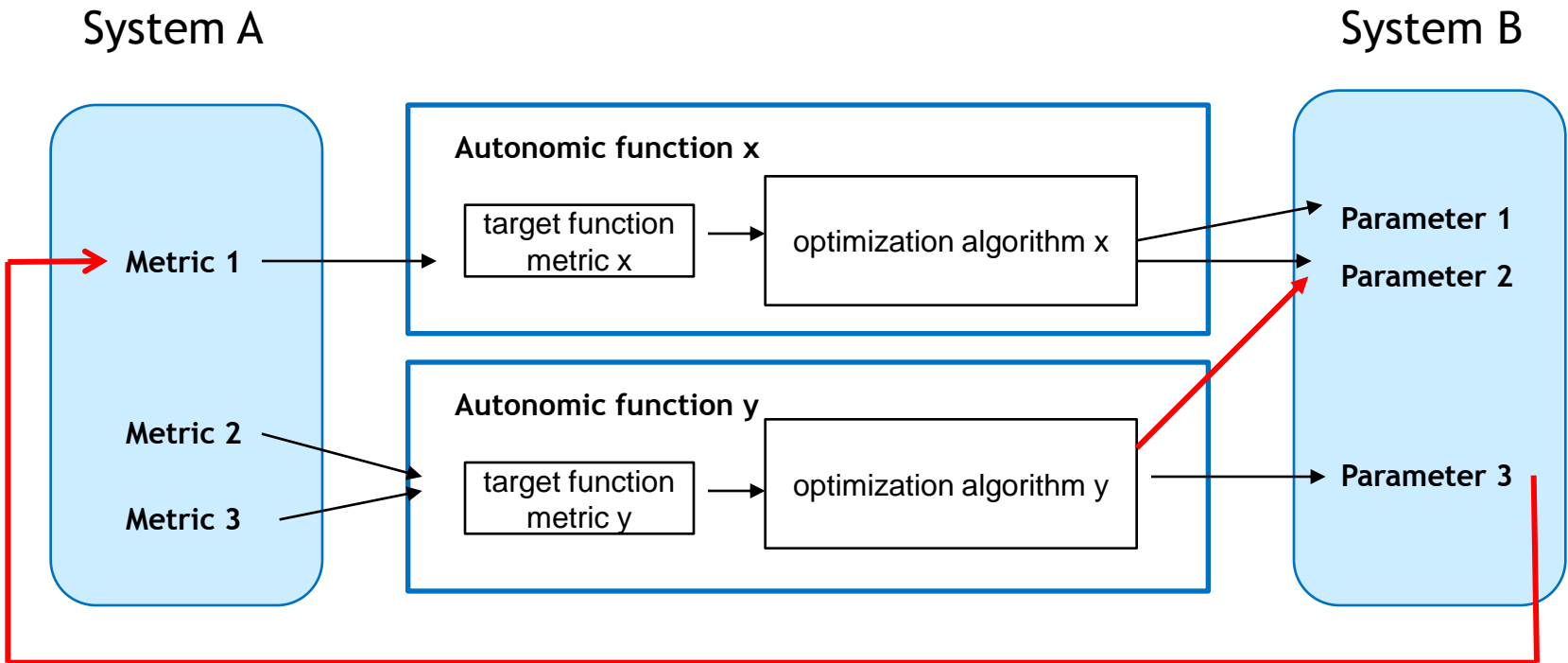


Coordinating multiple autonomic functions

IETF92 – Dallas

Pierre Peloso, Laurent Ciavaglia

Why we need coordination?



Metric value conflict:

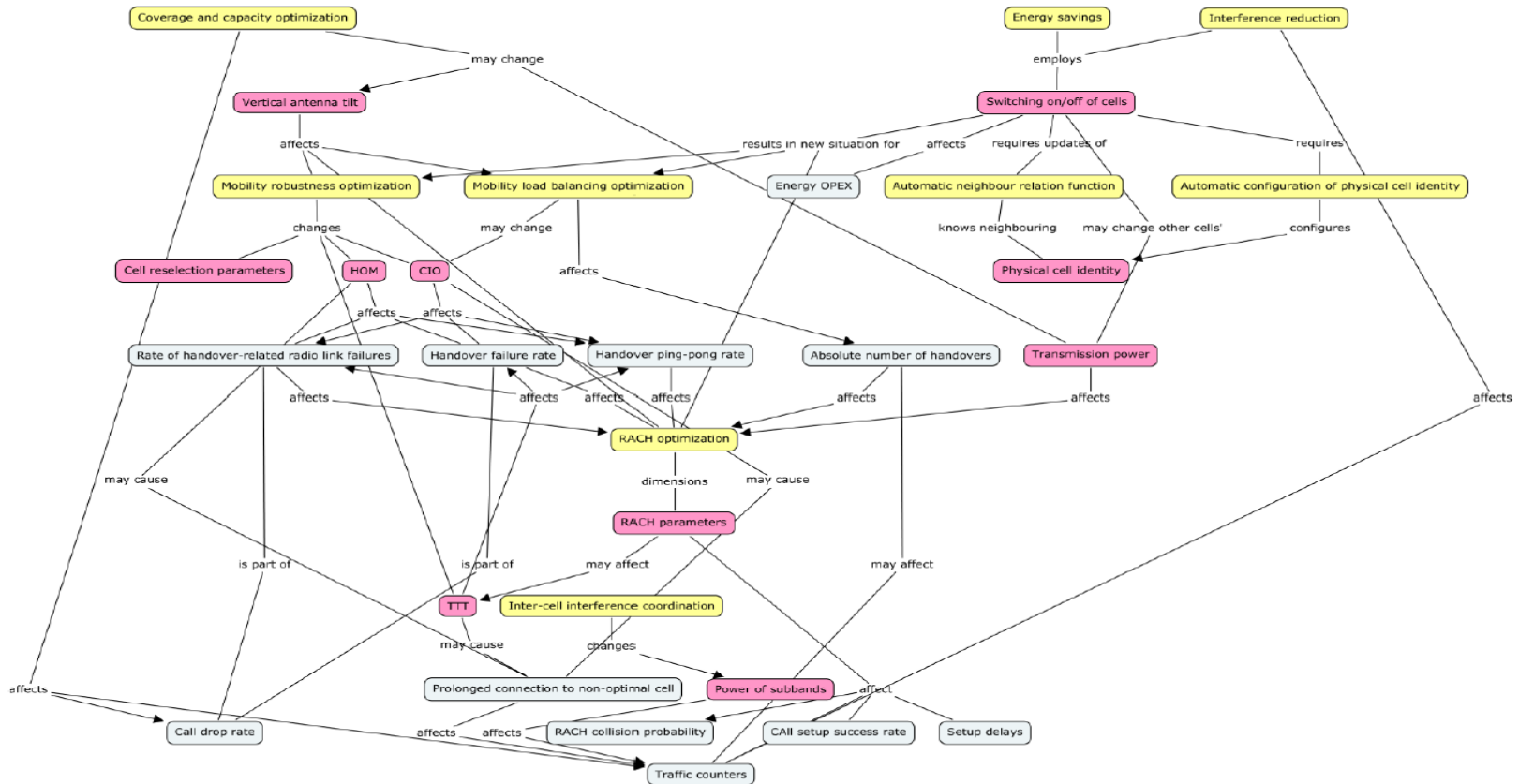
One metric is influenced by parameters of different autonomous functions

Parameter value conflict:

One parameter is modified by different autonomous functions

Why we need coordination?

- a static conflict map...



Interactions types

- Conflict
 - see previous slides
- Cooperation
 - An autonomic function can improve another one
- Dependency
 - An autonomic function cannot work without another one

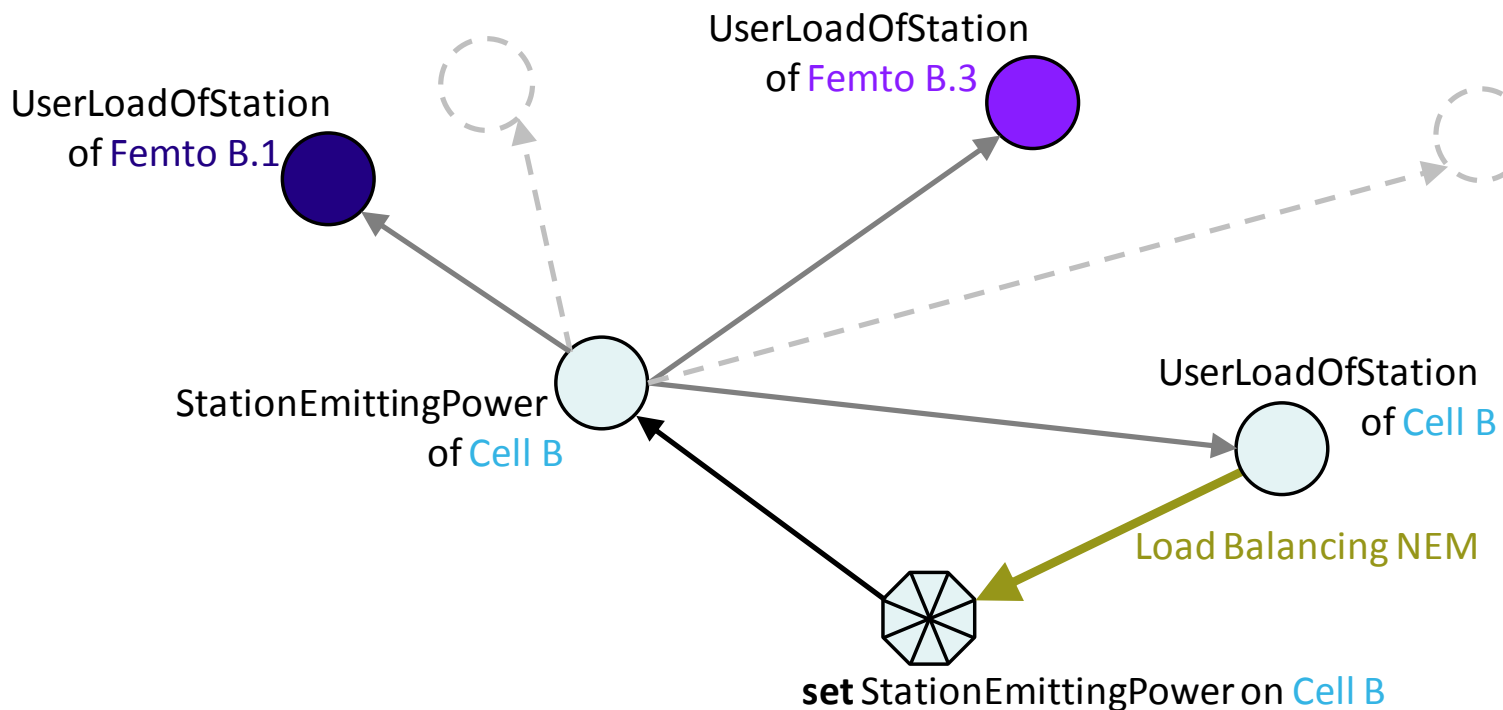
Coordination lifecycle

Specification	<ul style="list-style-type: none">-Autonomic function descriptor (metrics, parameters, actions...)-Static map, a priori knowledge
Deployment	<ul style="list-style-type: none">-Per instance/resource:<ul style="list-style-type: none">•inventory of metrics monitored, of actions performed and computation paths•build connected control loops graphs•Identify conflicting control loops-Deployed conflict map
Run-time	<ul style="list-style-type: none">-Arbitrate conflict based on coordination strategies and available mechanisms-Infer new dependencies-Dynamically update interaction groups

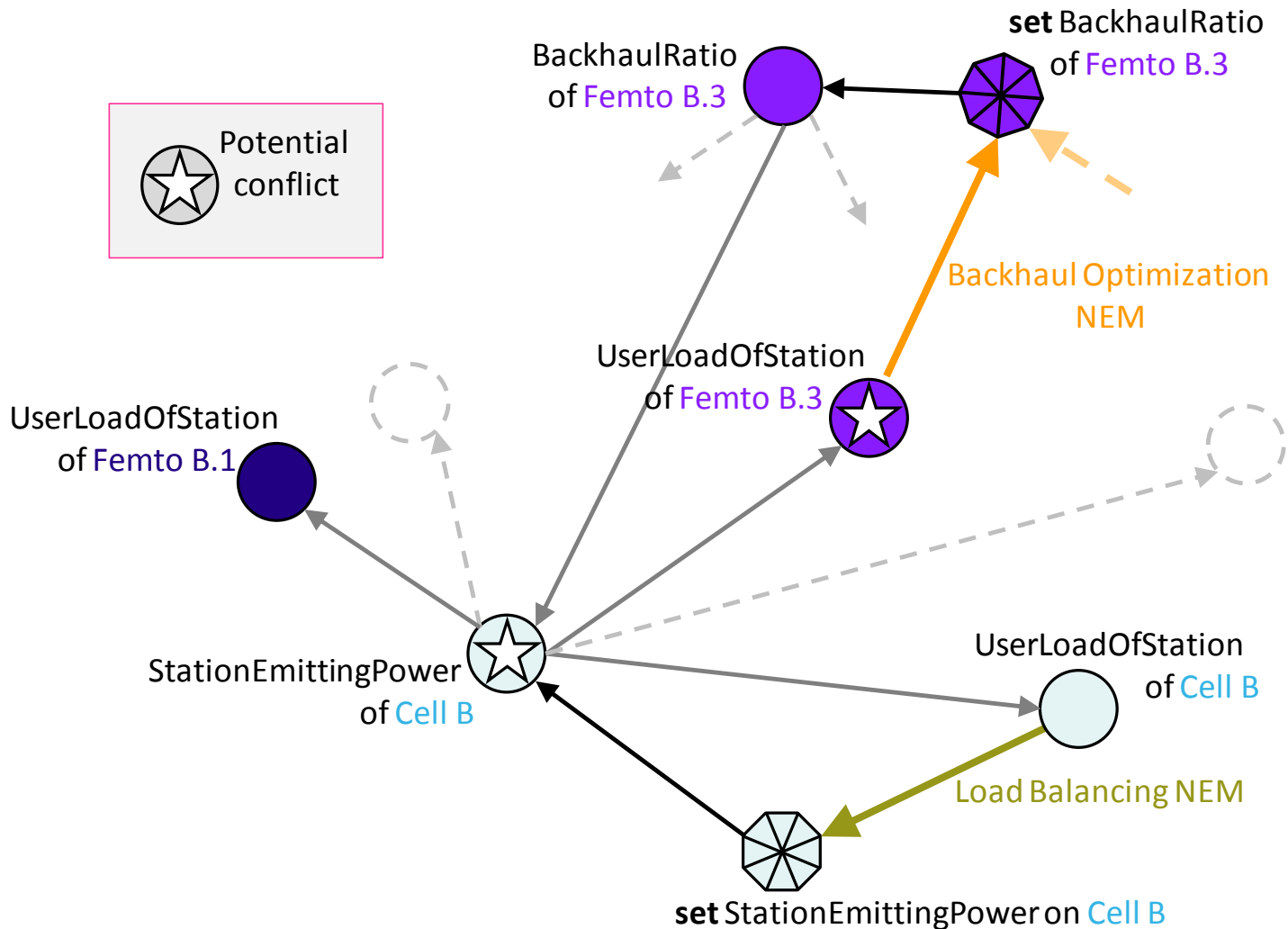
Knowledge-based Conflict Identification

$\text{StationEmittingPower}_{\text{CellB}} = \text{LoadBalancing}(\text{UserLoadOfStation}_{\text{CellB}}, \dots)$
[... in order to perform action] ← [takes as input...]

$\text{UserLoadOfStation}_{\text{FemtoB.3}} = F(\text{StationEmittingPower}_{\text{CellB}}, \text{FemtoB.3}, \dots, \dots)$
← [has impact on...]



Knowledge-based Conflict Identification



Coordination strategies

- Random, token-based...
- Separation in time
- Hierarchical optimization
- Centralized multi-objective optimization
- Other control theory approaches

Discuss: ANIMA implications

- Coordination:
 - a must-have feature (stability, convergence)
 - cross-autonomic functions (re-usable component)
 - requires common descriptors, lifecycle (registration/discovery, negotiation...)
 - common representation of information/knowledge (cf. conflict map)
 - common “control/command” interface