

SON Conflict Diagnosis in Heterogeneous Networks.

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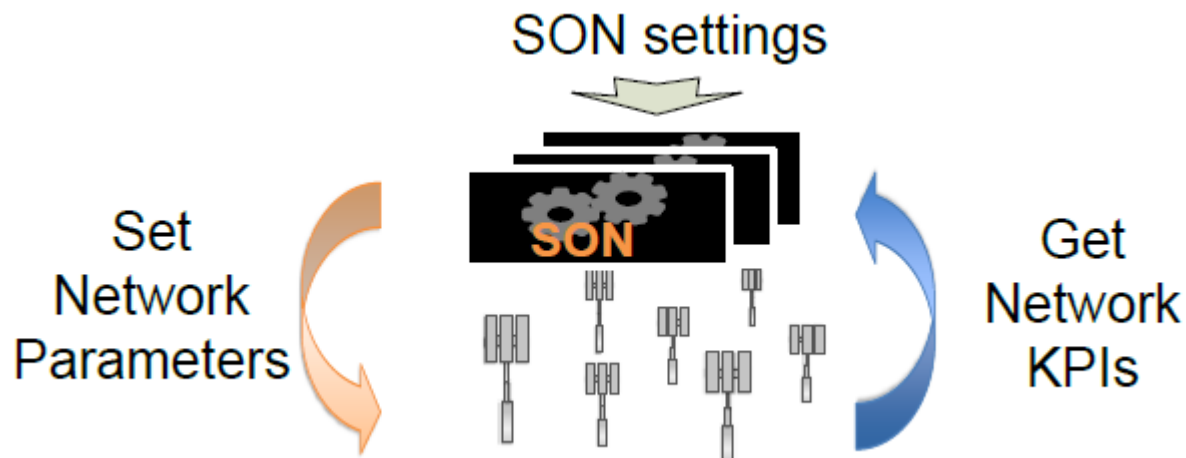


Presentation agenda:

- Introduction to SON
- Introduction to SON Conflict Diagnosis (SONCD)
 - Bayesian Network Classifier
- Results
- Conclusions

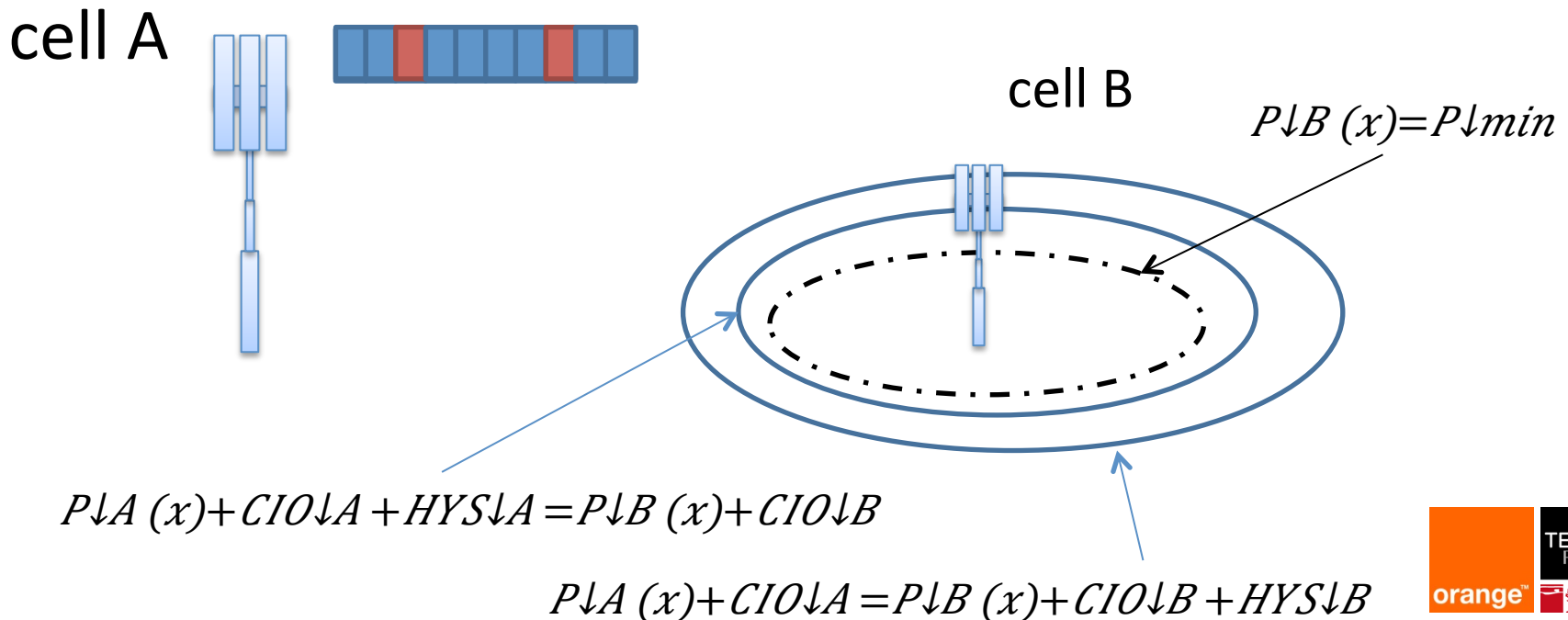
Introduction to SON

- ❑ SON functions are meant to automate network tuning (e.g. MLB, MRO, eICIC, etc.) in order to reduce CAPEX and OPEX.



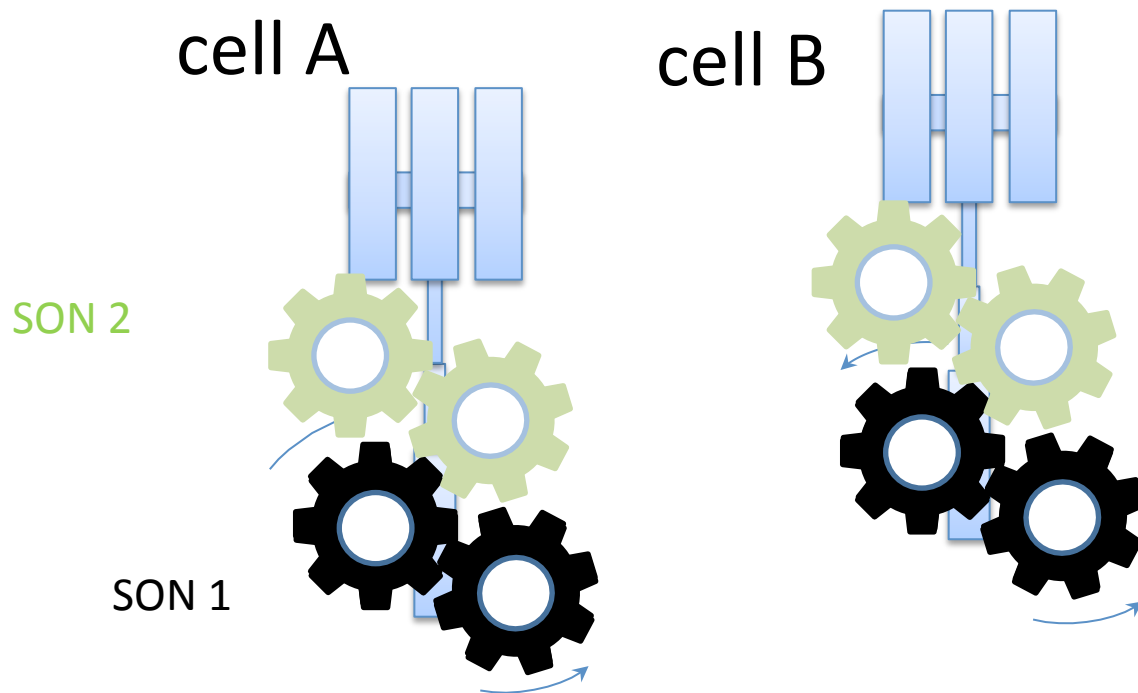
Example:

- ❑ Mobility Load Balancing/Cell Range Expansion (CRE):
tunes the Cell Individual Offset (CIO)
- ❑ Mobility Robustness Optimization (MRO):
tunes the HandOver (HO) Hysteresis (HYS)
- ❑ enhanced Inter Cell Interference Coordination (eICIC):
tunes the no of Almost Blank Sub-frames (ABS)

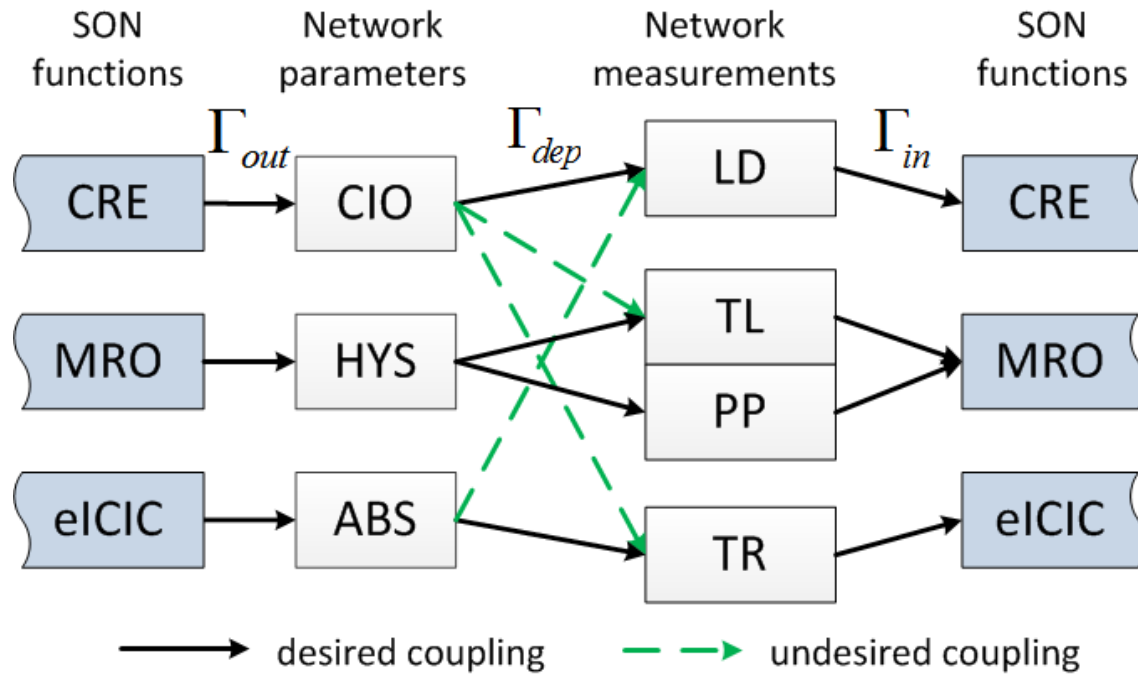


Introduction to SON Conflict Diagnosis (SONCD)

- ❑ Conflicts
 - ❑ measurement conflict: the output of one SON function impacts the input of another
 - ❑ parameter conflict: 2 SON functions targeting the same parameter



Potential Conflicts SONCD



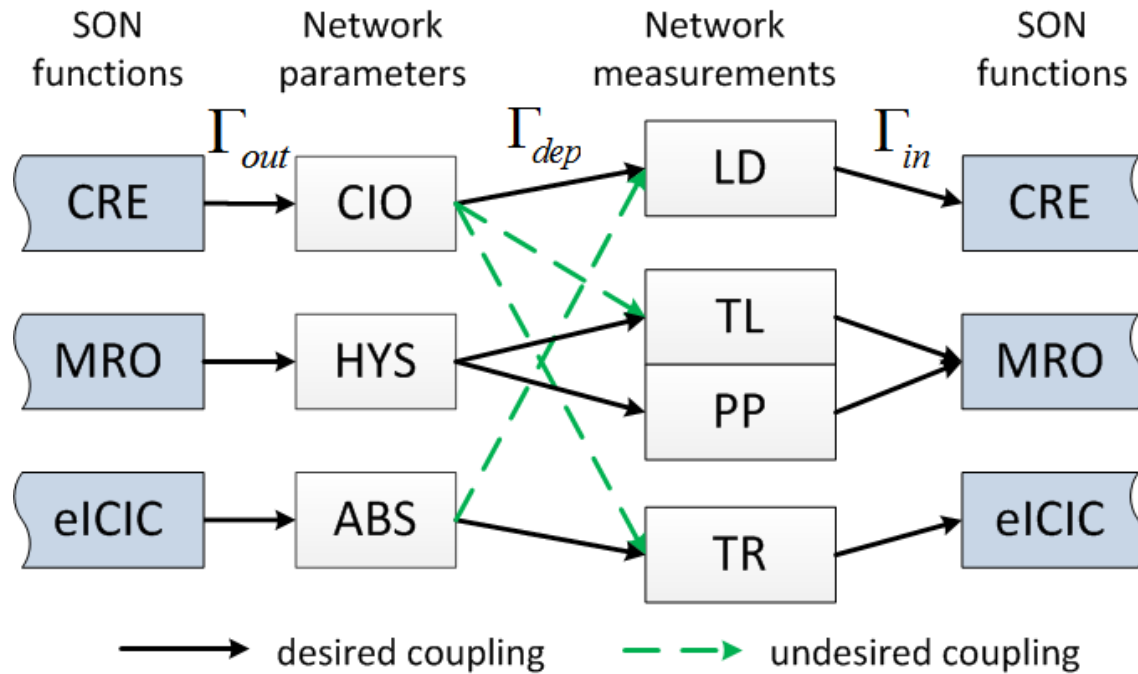
Symptoms (nw. measurements)

- S_{LD} = Load (Max)
- S_{TL} = % Too Late HOs (Av)
- S_{PP} = % Ping-Pong HOs (Av)
- S_{TR} = Throughput Ratio

Network Fault

$$\exists i, S_i > T \downarrow i$$

Potential Conflicts SONCD



Symptoms

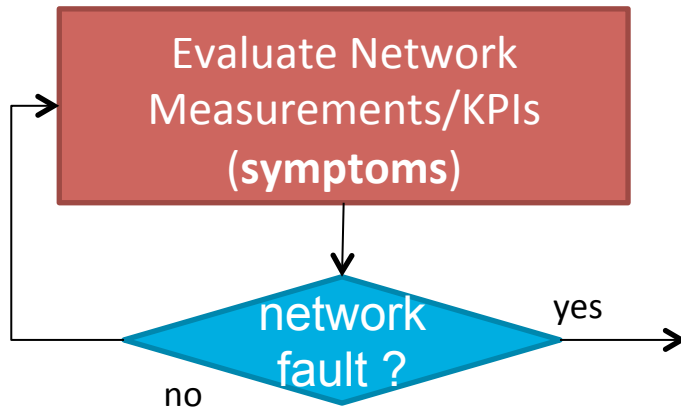
S_{LD} = Load (Max)
 S_{TL} = % Too Late HOs (Av)
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 S_{TR} = Throughput Ratio

Cause dictionary (D)

1 st order $C \downarrow 1$	2 nd order $C \downarrow 2$	3 rd order $C \downarrow 3$
(SON) 1. CRE 2. eICIC	(SON setting) 1. Trigger thresh. (T) 2. Step size (Δ)	(alteration degree) 1. high (h) 2. medium (m) 3. low (l)

x x

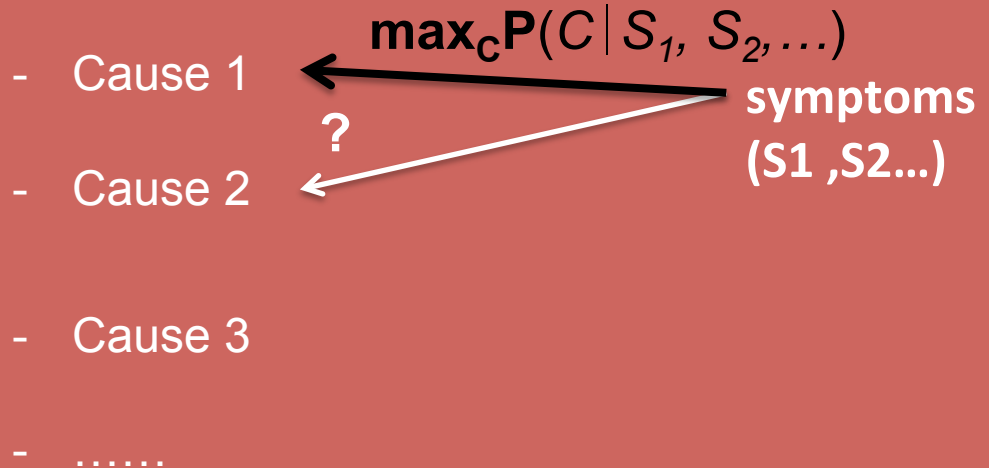
SONCD: block diagram



- network fault = bad network KPIs

Cause diagnosis: identify the misconfigured SON function

Causes (C):



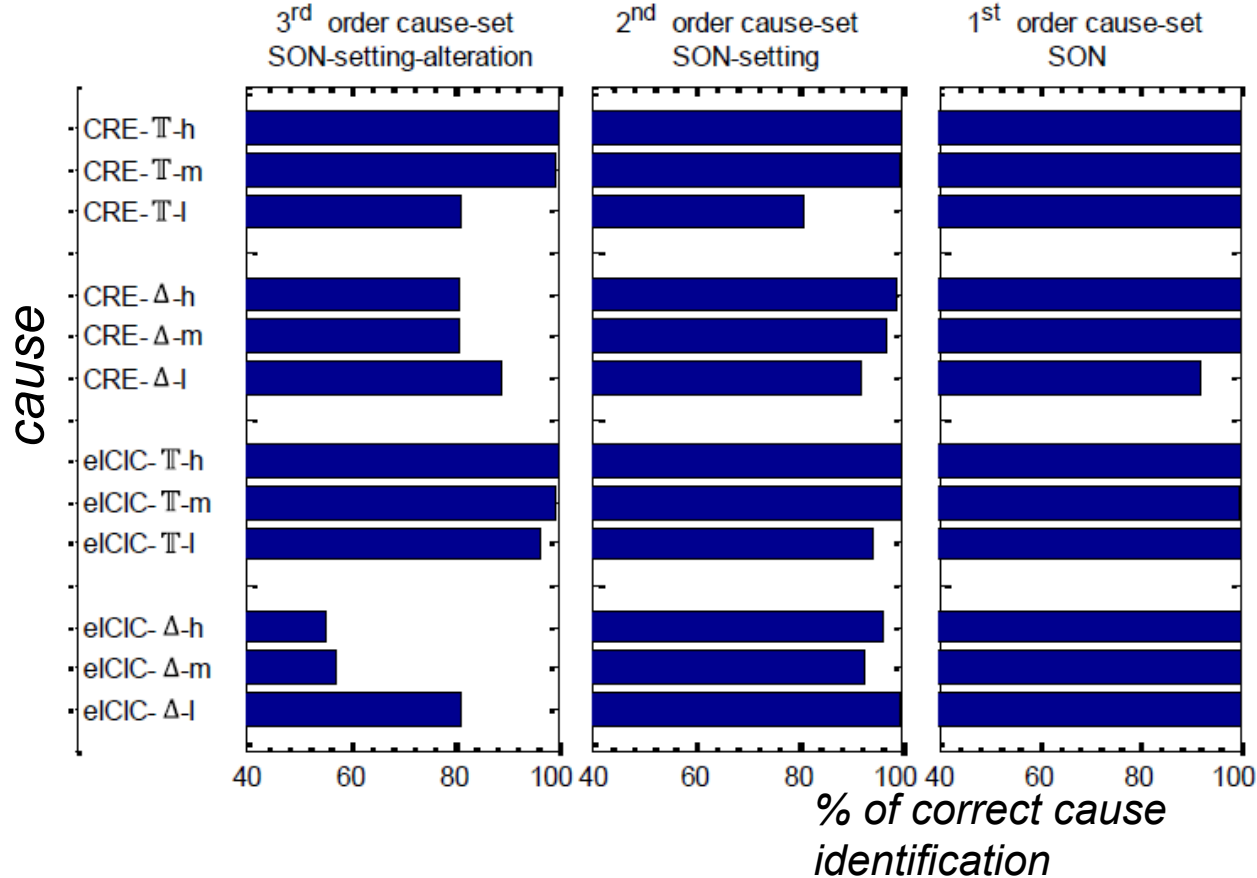
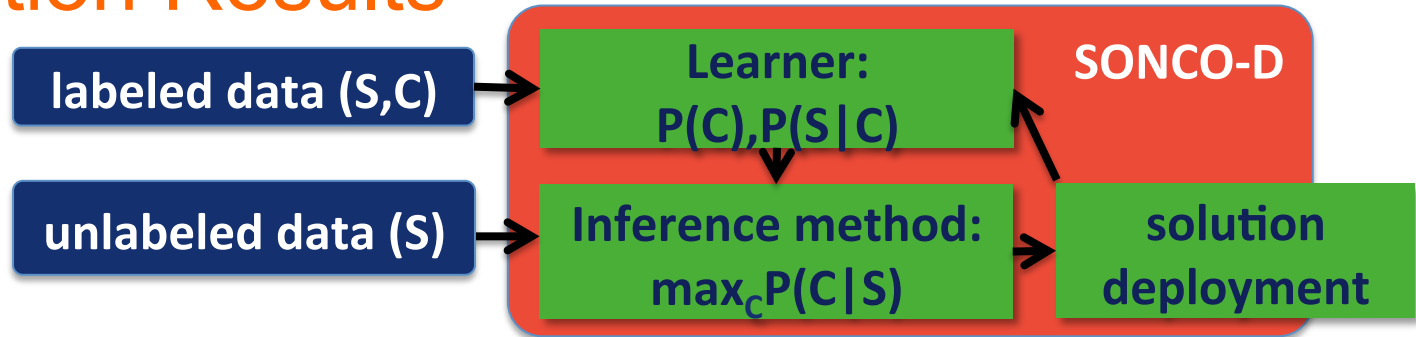
Bayes' Rule:

$$P(C | S_1, S_2, \dots) = \frac{P(C) P(S_1, S_2, \dots | C)}{P(S_1, S_2, \dots)} = \frac{P(C) \prod_i P(S_i | C)}{P(S_1, S_2, \dots)}$$

Naïve Bayesian Classifier Assumptions:

- symptoms are independent given the cause.
- one cause at a time

Simulation Results



Conclusion and future work

- SONCD: The NBC is a promising solution for the conflict diagnosis. The more details used for describe the causes the more difficult it is to correctly identify it.
- Future work:
 - create more SONCD friendly SON functions,
 - update the SONCD consequently.
 - E.g. the SON could raise intelligent and **honest** alarms to help the SONCO in the conflict resolution and the conflict diagnosis.

Questions ?

