Autonomous Component Carrier Selection as Small Cells Deployment Enabler

Outcome of the FP7-INFO-ICT-248268 Project: Spectrum Aggregation and Multi-User MIMO: Real-World Impact (SAMURAI)
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Summary

• The deployment of uncoordinated small cells will create interference problems:
  – High cell density is the cause of the problems
  – Outage limits the experience of the users
  – Higher reuse factors than Reuse-1 can help, but we want no planning

• Autonomous Component Carrier Selection
  – Solution in the frequency domain (Carrier-Based ICIC)
  – Autonomous frequency configuration (Plug & Play)
  – Dynamic capacity boost on best effort base when needed
  – It can enable inter-operator spectrum sharing
  – It offers protection of control and data channels

• We proved in real life with a demonstration test bed that it is feasible and provide benefits
The SAMURAI Project

- Spectrum Aggregation and Multi-User MIMO: ReAl-world Impact
- Two main research lines:
  - Increase in spectral efficiency: MU-MIMO
  - Better spectrum utilization: Carrier Aggregation (CA)
- Industrial feasibility as main goal:
  - MU-MIMO and CA PHY Proof-of-Concept (PoC)
  - Autonomous Component Carrier Selection (ACCS) PoC

Algorithmic Development
Link / System level simulation validation
SDR test bed prototyping
ACCS in synthesis

1. Basic cell coverage: **Base Component Carrier (BCC)**.
2. Supplementary Component Carriers (SCC) added for extra capacity.
3. SCCs allocated if interference to neighboring cells allows.

**Main functioning principles**

- Inter Cell "X2-like" signalling
Development of a simplified testbed for ACCS PoC.

- Based on COTS SDR (Ettus/NI USRP N200)
- COTS Computer
- Simplified Software Modem (SW BB processing)
- Oriented to "Cognitive" RRM experimentation
- It can make use of wired (Ethernet) or wireless (WiFi) backhaul
ACCS PoC demo (2)
No "users" are suffering for having this gain at the cost of increased overhead due to "X2-type" inter-cell signalling.
”Wish List”

- If you had 30 to 60 MHz of spectrum, what would convince you to use ACCS?

- Would you be open to share the spectrum with other operators in local area, low power, dedicated spectrum scenario? (Maybe 3.6 GHz?)

- Do you consider massive (uncoordinated) small cell deployment without prior network planning, or is small deployment still considered to be based planning considerations to avoid unfortunate interference conditions?

- Would you consider even more dynamic ”cognitive-like” techniques? And how would you set a standardization framework for them?