

# What is CORAL\*?

- A Wi-Fi® router with a cognitive radio control shell around it, thus creating the **WIFI\_CR** unit
- **WIFI\_CR**: has IEEE 802.11g PHY attributes. However with the **CR\_NMS** control system we implement a cognitive radio as defined by the ITU....which uses environment knowledge, dynamically & autonomously adjusts, learns...
- It implements all the functionality of CR: Radio Environment sensing, virtual environment memory, cognitive engines, control channel, undertakes network and terminal re-configurability, and can be used create numerous wireless topologies: Mesh, Pico-cell networks, Femtocells, P-MP/P-P, relays, etc..
- CORAL is a **CR development platform** allowing implementation of Cognitive Networks in the ISM band...where interference, fallow spectrum, primary users, and poor propagation are the norm....If Cognitive Radio can solve wireless problems in the ISM band, it will probably solve them in other, less demanding band...like the TV bands
- Will give developers fresh approaches to wireless...especially in the ISM band which uses a technology (WIFI/IEEE 802.11) that is not spectrum efficient in high interference and is in need of improvement after 15 years of the same old access algorithms...
- How about a cognitive ISM band MIMO router in the home that shares spectrum with its neighbors..and acts as a femtocell for cellular? New approaches to old wireless concepts.

\* Developed by the Communications Research Centre/Industry Canada

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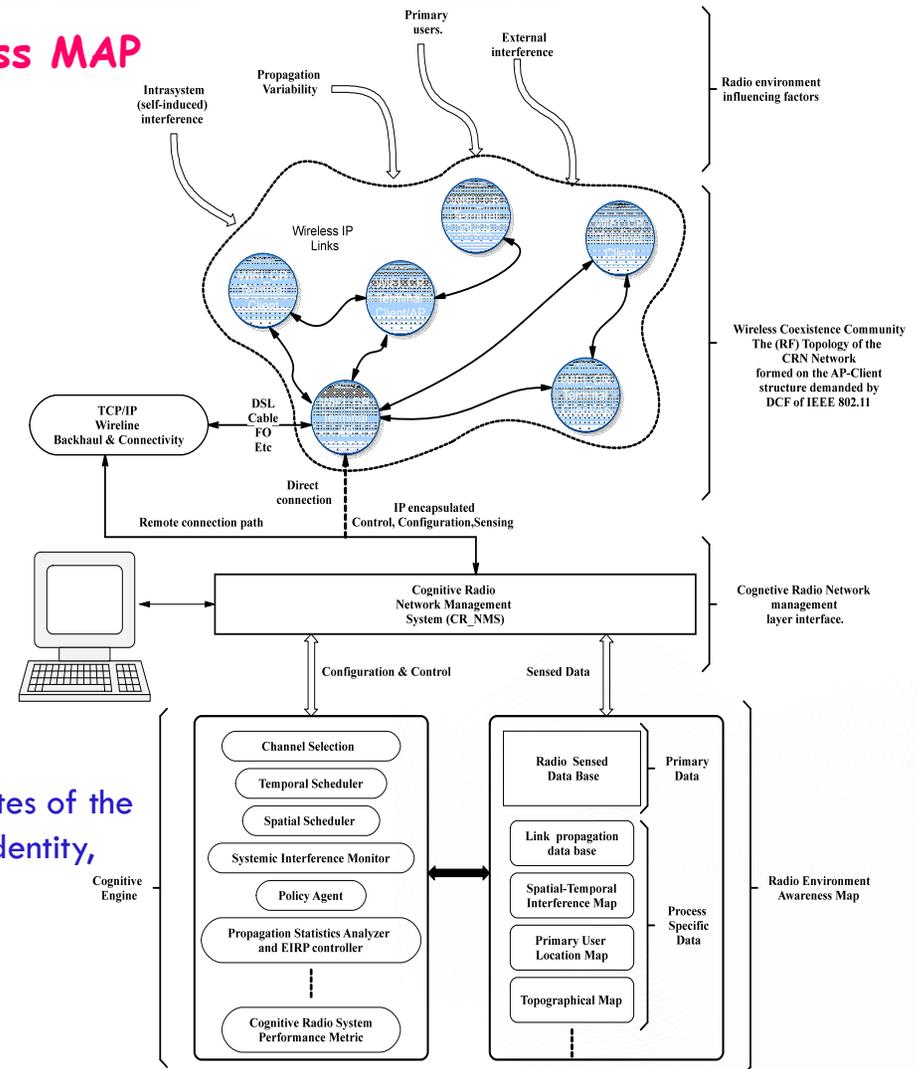
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# A demonstration of CORAL's CR capabilities.. for Dyspan 2010

## (1) Creation of a Radio Environment Awareness MAP

A virtual representation of the Radio Environment is required for learning and decision making by the Cognitive Engines. We will show how CORAL:

- Captures full ISM band WI-Fi interference by providing occupancy information, interference power, identity, IP Link associations; undertakes spectrum analysis; can incorporate specific sensors,
- Can 'Sniff' specific sectors capturing interference that is spatially dependent,
- Collects throughput and channel utilization data by the members of the CRN to aid in bandwidth allocation,
- Creates a map of the interference and occupancy attributes of the CRN that can be searched by time, space, spectrum, RSSI, identity, IP link, occupancy, etc.



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## (2) Dynamic Spectrum Assignment

- Using the REAM and Sensor information, the CORAL CRN ( AP with 3 clients) selects the most appropriate ISM channel based on occupancy, interference, power level, duration, and user terminal's bandwidth (fairness) requirements.
- Dynamically moves to alternate channel when interference environment changes.

## (3) Primary User detection-alternative channel

- **move** On detection of a Mimicked Primary User that appear on-channel, CORAL moves to an alternative channel...mimicking TV band/radar detection type actions.

## (4) Spatial Selection for Interference Mitigation

- Demonstration of how CORAL system can change its reception pattern, allowing selection of direction and sectors less prone to interference.
- Demonstration of CORAL's TDD/TDMA Wi-Fi capability; per packet directional switching that can be used by cognitive engines with spatial interference knowledge.

