



# HETEROGENEOUS DEPLOYMENTS USING SOFT CELLS

Dr. Christian Hoymann, Ericsson Research

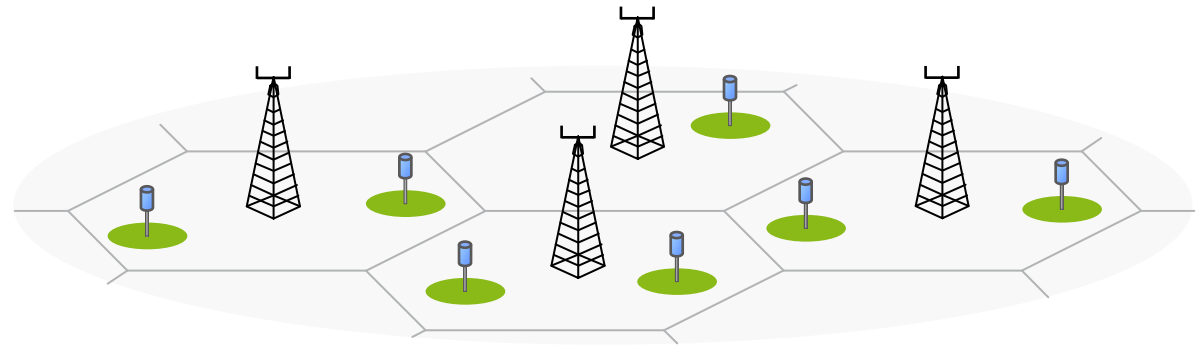
ComNets FFV, 16.3.2012, Aachen

# HETEROGENEOUS DEPLOYMENTS



## › *What?*

Low power nodes placed throughout a macro-cell layout



## › *Why?*

Capacity ➔ additional "cells"

High data rates ➔ dense infrastructure

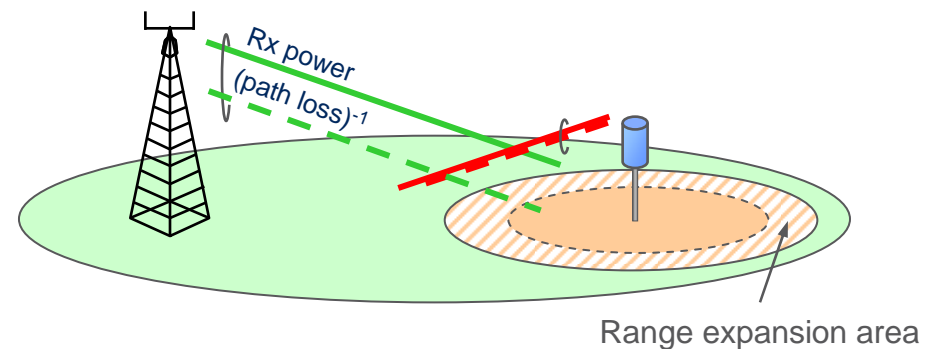
...but typically non-uniform user distribution

➔ macro for full area coverage, pico for high data rates/capacity

# RANGE EXPANSION



- › Heterogeneous deployments – which node to connect to?
  - Traditionally based on downlink measurements (best downlink)

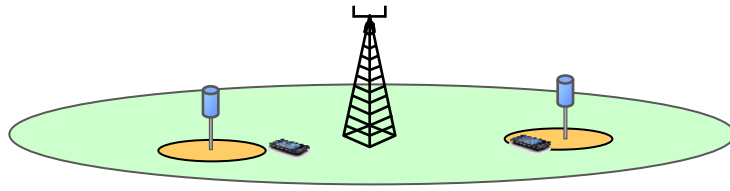


- › *Range expansion* – increasing pico node uptake area
  - Increase offloading effect (spatial reuse of radio resources)
  - But operation in low geometry
    - › Data protection by Intercell-interference Coordination (Rel-8 ICIC)
    - › *But how to ensure reception of control signaling from pico?*
    - › *How to mitigate interference of cell-specific reference signals?*

# 3GPP TOOLBOX

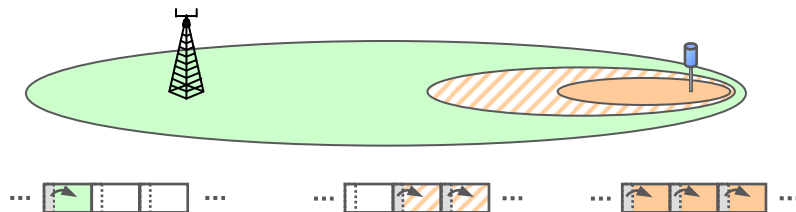


## Baseline



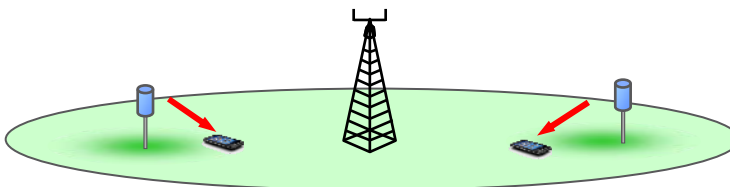
- › Unsynchronized network
- › **Modest** range expansion
- › Existing Rel-8 functionality

## Resource partitioning



- › Synchronized network
- › **Excessive** range expansion
- › Macro-pico resource partitioning for control (eICIC or CA in Rel-10)
- › UE based CRS cancellation in Rel-11

## Soft Cell

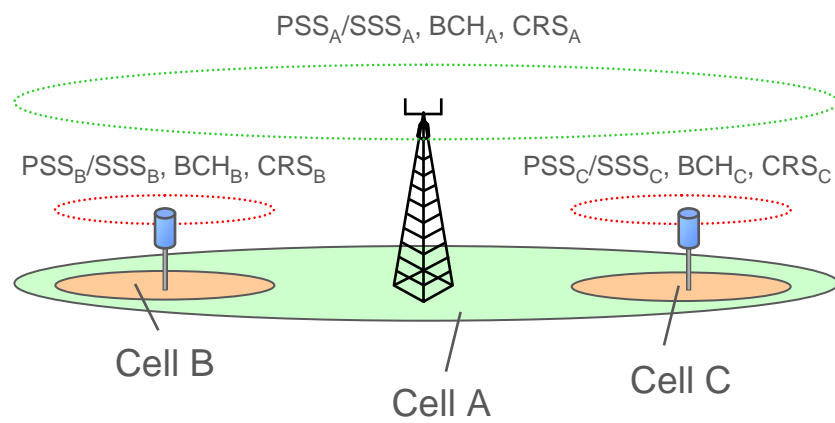


- › See next slides...

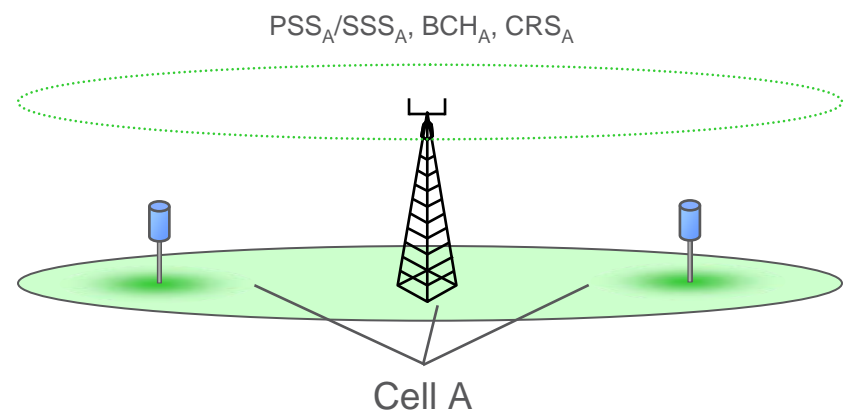
# HARD CELL VS. SOFT CELL



- › Pico node *does* create new cell
  - *Continuous* transmission
    - › Synchronisation signals
    - › Reference signals
    - › Broadcasted system Info
    - › Data and control based on cell-specific RS



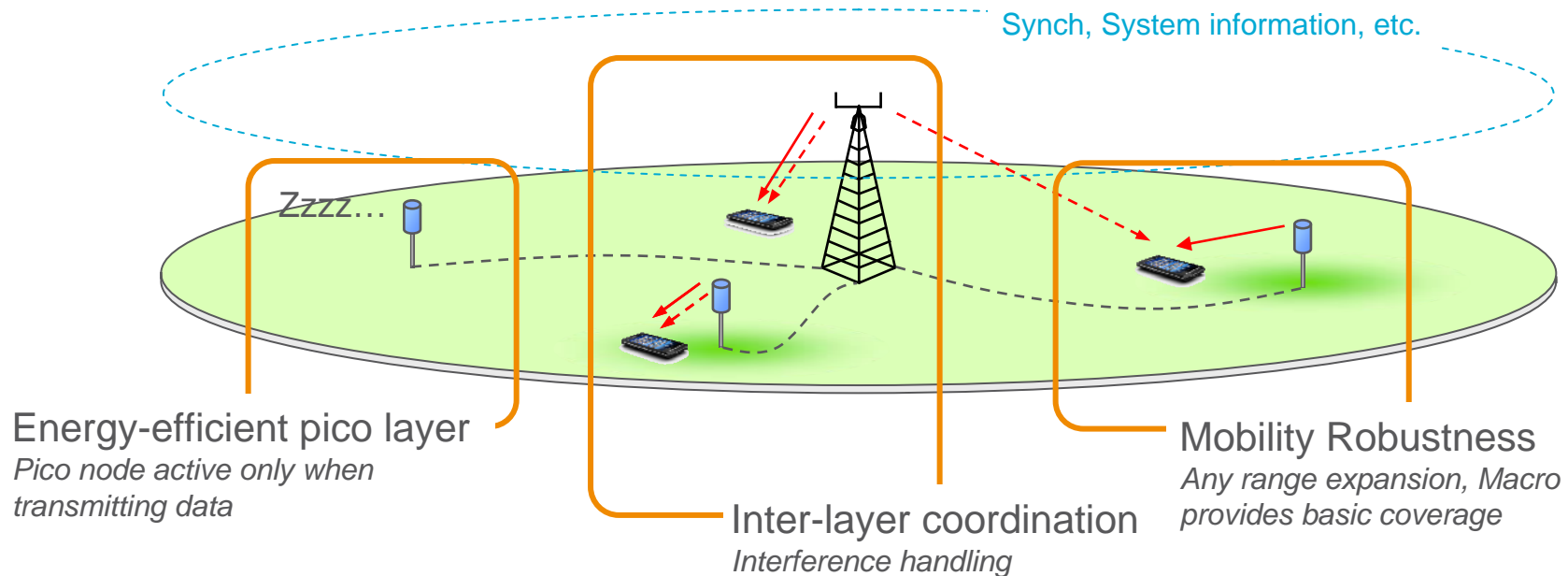
- › Pico node does *not* create new cells
  - *Only when needed* transmission of
    - › Data based on UE-specific RS
    - › Control based on UE-specific RS





# SOFT CELL

- › Decouple *System Info / control plane* from *user data* transmission
  - Macro: *basic coverage* and connectivity
    - › Synch, system info, basic control
  - Pico: *enhanced capacity and data rates* when needed
    - › Data based on UE-specific RS
    - › Rel-11 ePDCCH (UE-specific RS)



# SOFT CELL EVOLUTION

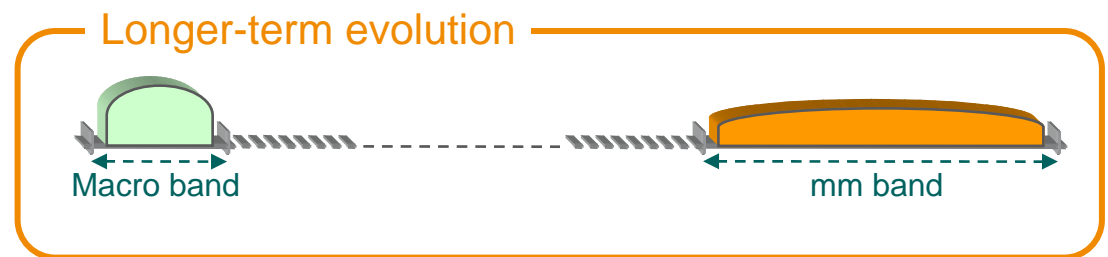
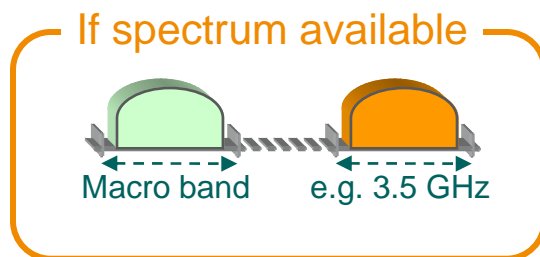
## REL-12 ENHANCED LOCAL ACCESS



- › Same-frequency operation
  - Basic functionality part of Rel-11
  - Enhancements in Rel-12
  - Example: pico node sync signal, ...*



- › **Frequency-separated** pico layer
  - Important part of Rel-12 work on local access





**ERICSSON**