



# SDR Evolution in Consumer and Dual-Use Telecom Products

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# Outline

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- Role of Software in Telecom Products
- State-of-the-art in Commercial SDR
- Benefits and Challenges of SDR
- Significance of SW Architecture for Success of SDR
- SDR and Dual Use Model
- Summary



# EB in Brief



# EB Today



- EB's customers are the leading companies in the automotive and wireless markets.
- EB provides demanding embedded software and hardware solutions.
- EB's technical core competences are:
  - Wireless technologies and solutions
  - System and software architectures
  - Automotive-grade software
- Net Sales of MEUR 144 in 2007.
- Listed on OMX Nordic Exchange Helsinki.
- Over 1700 employees in 7 countries, 3 continents.

# The Next Big Wireless Experience



- Our passion for your success drives us at improving your revenues
  - We enable new business opportunities and core business expansion for our customers
- We turn the next generation wireless technologies into experiences within
  - wireless device and platform development
  - mobile WiMAX basestation development
- EB offers value creating solutions to meet customer requirement by Integrating
  - EB assets and assets from other leading edge technology companies



# Forerunner in Wireless Solutions



- EB is a forerunner in developing global wireless solutions
  - Mobile WiMAX Handset Reference Design
  - EB mobile WiMAX basestation framework
  - Satellite/Terrestrial Reference PDA Phone
  - Close to 100 different handsets shipping with EB's R&D contributions
  - Network components and contributions to over 200 R&D projects

# Role of Software in Telecom Products



# Role of Software in Computers



Image source: [www.technikum29.de](http://www.technikum29.de)



Image source: [www.greendisk.com](http://www.greendisk.com)



Image source: [laptop.hp.com](http://laptop.hp.com)



EB MID reference device

## Computers

- **60's**: mainframe: no SW but programs
- **70's** minicomputers: HW rules, dedicated proprietary SW
- **80's** desktop computing: HW independent application SW emerges
- **90's** laptop computing: HW and platform SW commoditized, user value in application SW
- **2000's** device convergence: SW and services rule



# Role of Software in Mobile Phones



- In mobile phones we are in the 80's computers situation
  - Device independent application SW is available both commercially and free of charge
  - Operating systems: few contenders remain (Symbian, Windows mobile, Linux variants)
  - Core radio functionality: proprietary HW and SW solutions

**Will mobile phone HW be commoditized in the 2010's?**

# State-of-the-art in Commercial SDR

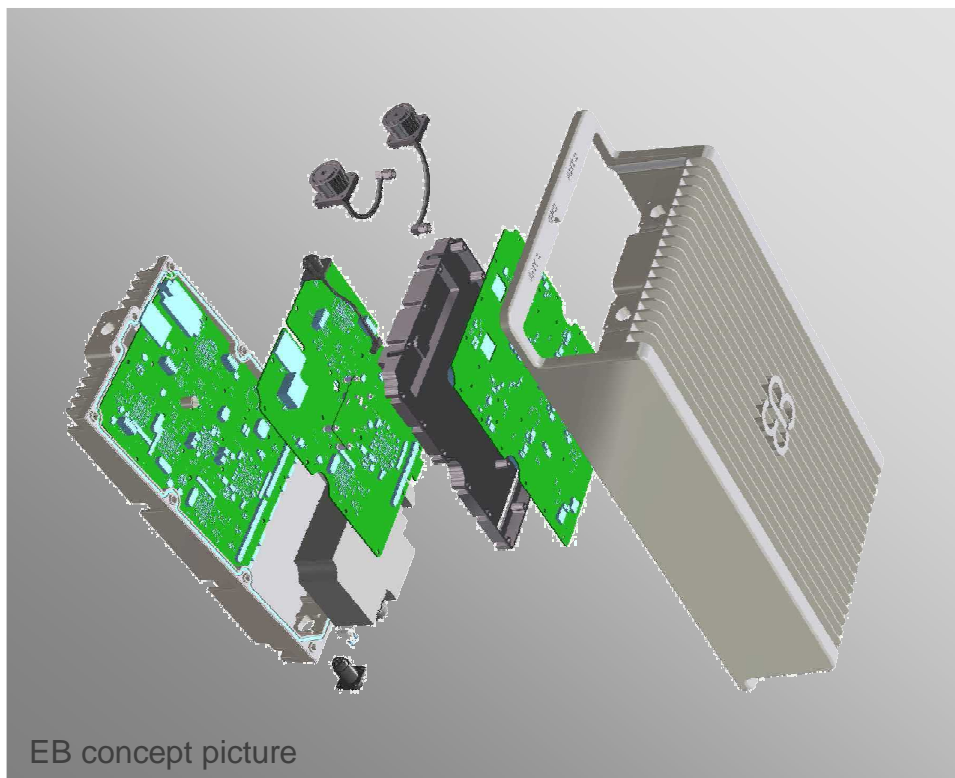


# State-of-the-art in Consumer Terminal Products



- **Consumer devices: stacked multiradio with**
  - Satellite
  - WCDMA
  - GSM
  - WLAN
  - Bluetooth

# State-of-the-art in Cellular Infrastructure Products



- **Cellular networks: SDR is a current reality**
  - Example 1: Upgrade base station from WCDMA to HSDPA and to LTE with pure SW upgrade
  - Example 2: SDR based mixed mode WCDMA/GSM base station products announced during 2008.

# State-of-the-art in Military and Special Products



Image source: [www.army-guide.com](http://www.army-guide.com)

- Some SDR based terminals in the market
  - Examples: Thales, Harris
- Some SDR based networks in the market
  - Example: Harris HNW tactical backbone network
- In the US: JTRS procurement ongoing
- In Europe: ESSOR program initiated, under EDA coordination

# Benefits and Challenges of SDR



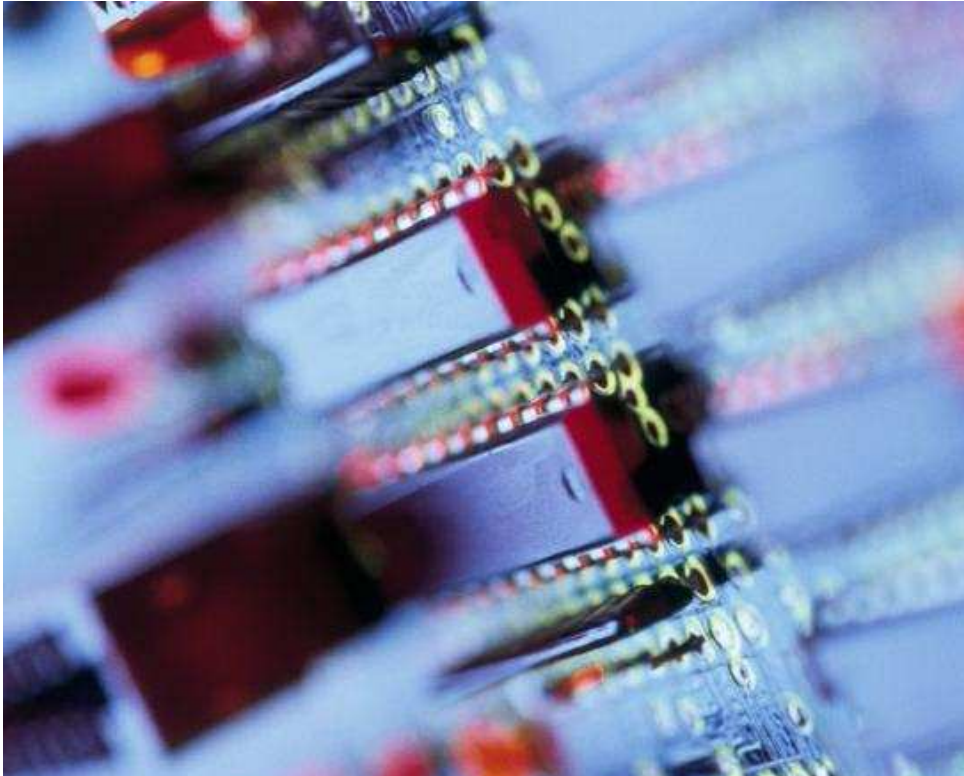
# Current Issues and Challenges with SDR



Image source: [www.celtnet.org.uk](http://www.celtnet.org.uk)

- **Cost (material and R&D)**
- **Power consumption**
- **Performance**

# SDR Value Proposition – Industry Benefits



- **Flexibility** and **adaptability** for mass customization in development and deployment
- Significant life-cycle **cost reductions**
- Critical time-to market **enhancements**
- More efficient **re-use of intellectual property** through portability of software
- More efficient **radio spectrum utilization** through flexible spectrum access
- Critical enabler for cognitive combine radio





# SDR Value Proposition – User Benefits

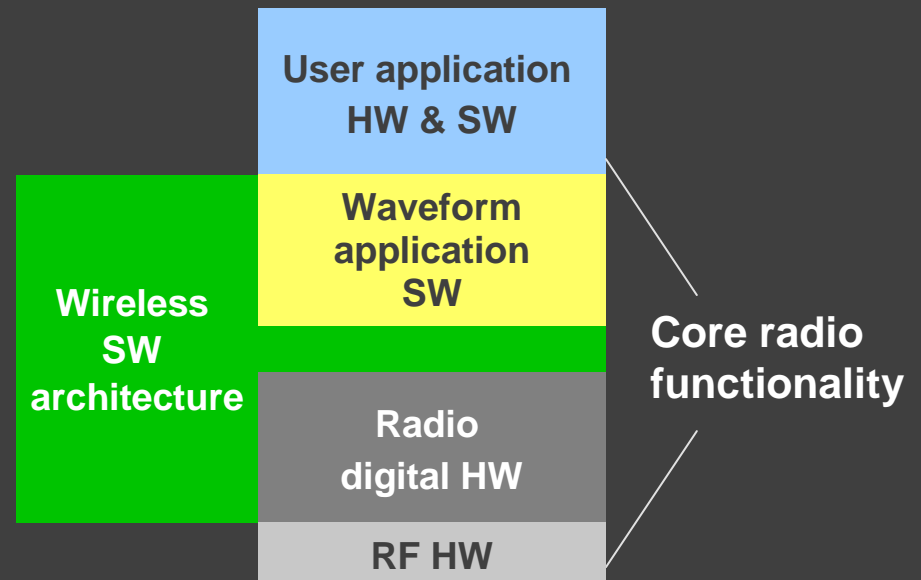
- Non-restrictive wireless roaming
- Enhanced radio **versatility** through over the air downloads of new radio features and services
- Enhanced radio **reliability** through over the air downloads of software patches

# Significance of SW Architecture for Success of SDR



# Significance of Unified SW Architecture

- **Challenge;** The need to effectively de-couple the digital HW from the waveform application software.
- **Solution;** The key is to do this de-coupling in the same way, with the same API's and interfaces applied, across the product portfolio.



# Open SW architecture

- An open SW architecture extends the open interfaces and API's across the industry
- **EB vision:** Standardized open architectures and software are the winners in the future telecom market, as we have seen them to be winners in the information technology market in general.

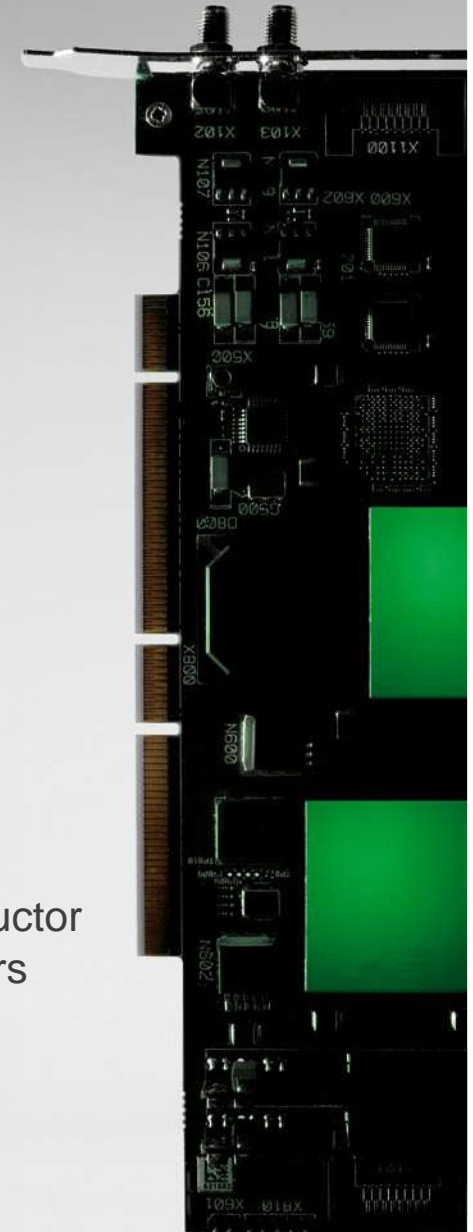


# SDR and Dual Use Model



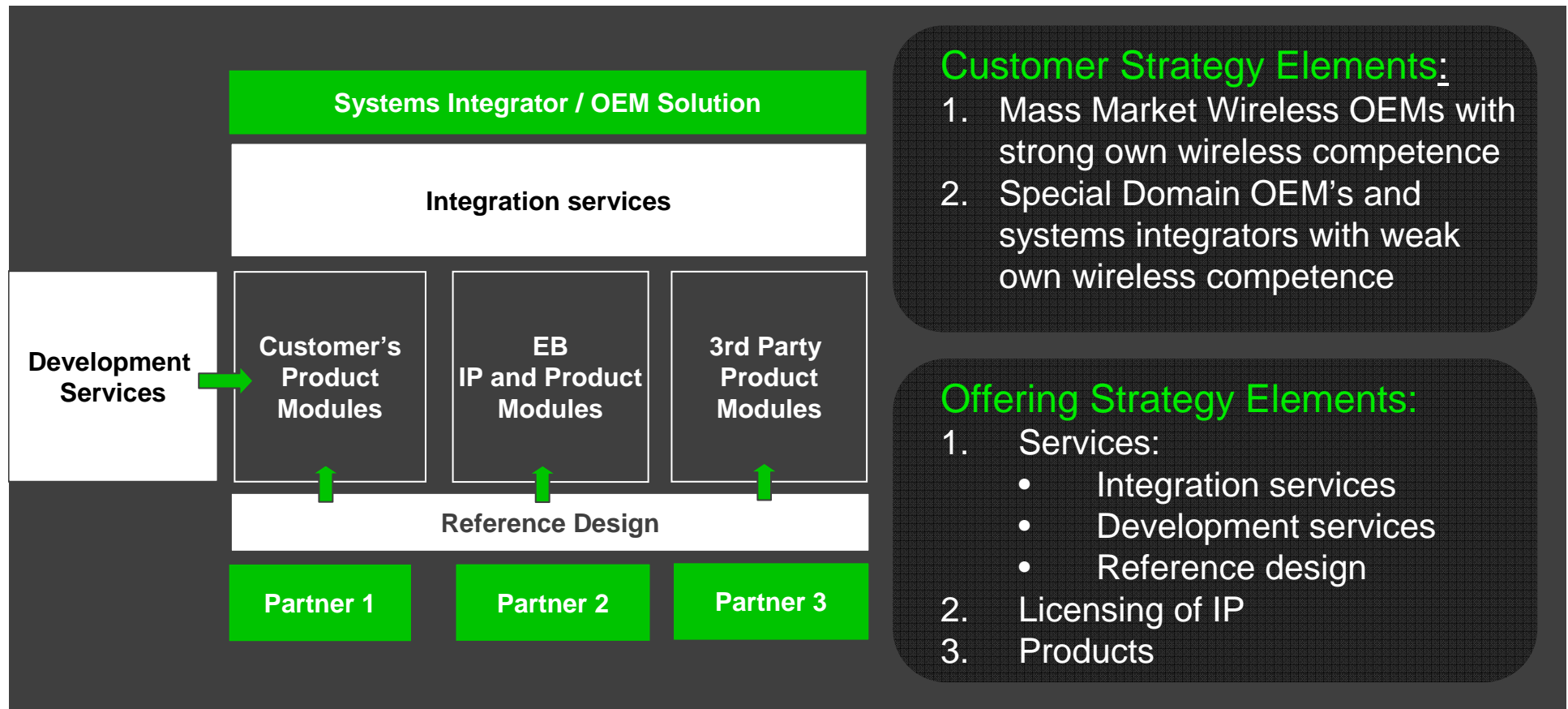


# SDR and Dual Use Model



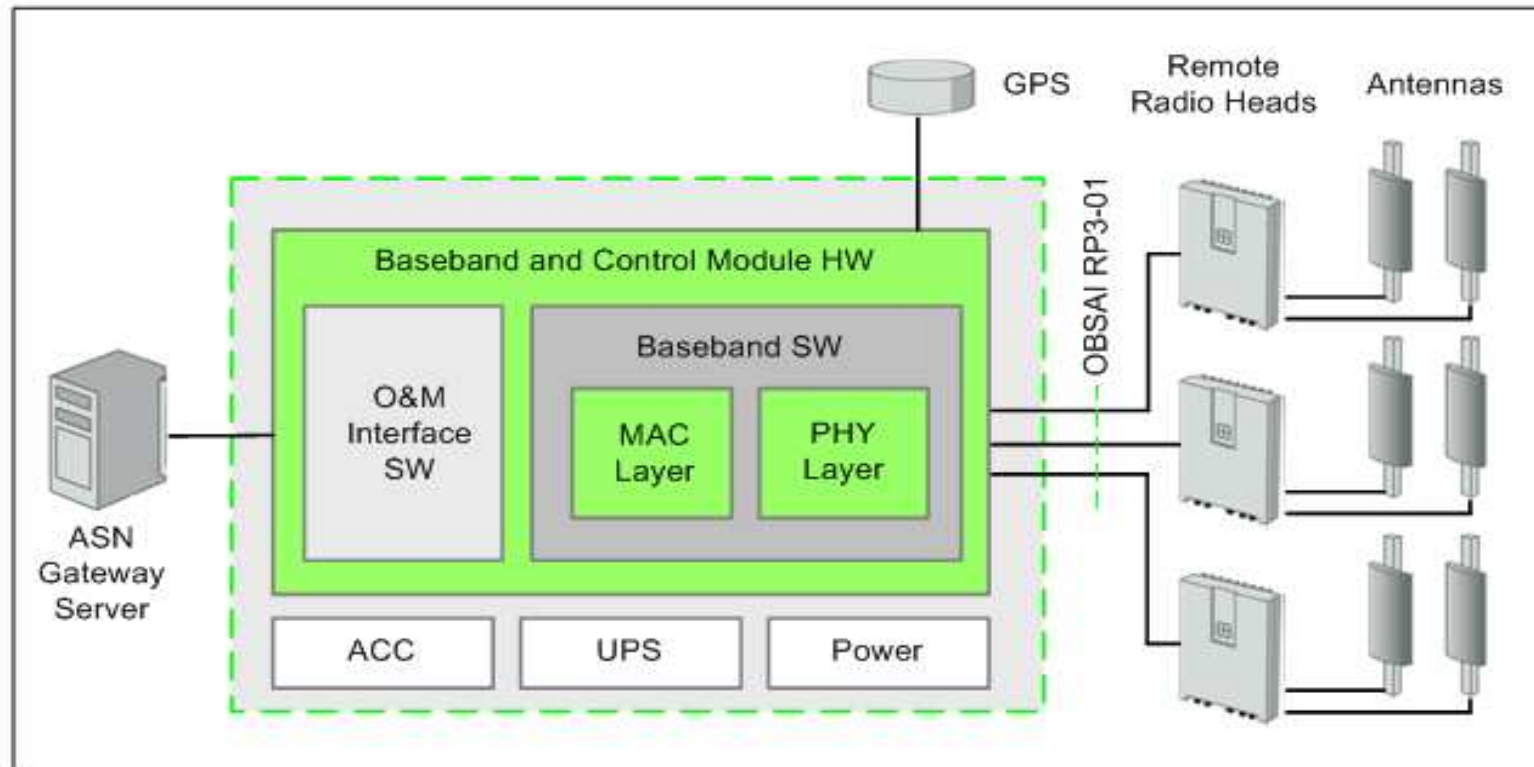
# Wireless Solutions:

## - Solutions Strategy Elements



# Wireless Solutions:

- Mobile Infra WiMAX Solution





# Summary



# Summary

The role and significance of **SW in telecom products is increasing** and will gradually overshadow that of the HW

SDR is an evolutionary path: Military -> Special Domain -> Consumer



None of the SDR benefits can be fully realised without a **unified software architecture decoupling** the waveform SW from the radio HW

SDR with **open SW architectures** enables more efficient technology cross-utilization between the military and consumer domains, resulting in **cost savings** and in increased **innovation**





Discover the Experience



# Keynote Abstract

Even though SDR technology has been introduced and widely used in commercial market, especially in carrier grade network equipment, the revolution to use de facto standards like SCA has not been seen yet. In high performance commercial telecom equipment, it is still customary to use proprietary middleware, or even hardware configurations when driving force is for example power consumption instead of software portability. While new more powerful chips are coming to FPGA's and DSP's, it can be foreseen that more and more commercial products, even tiny handsets, can be produced by using SDR technology. In this evolution the need for a capable and widely used common architecture is essential in order to fully capitalize the benefits from the technology transition. Standardized, open architectures and software can be seen as the winning techniques in future telecom market, as we have seen them to be in information technology market in general.

