The Impact of SDR on Baseband Processing

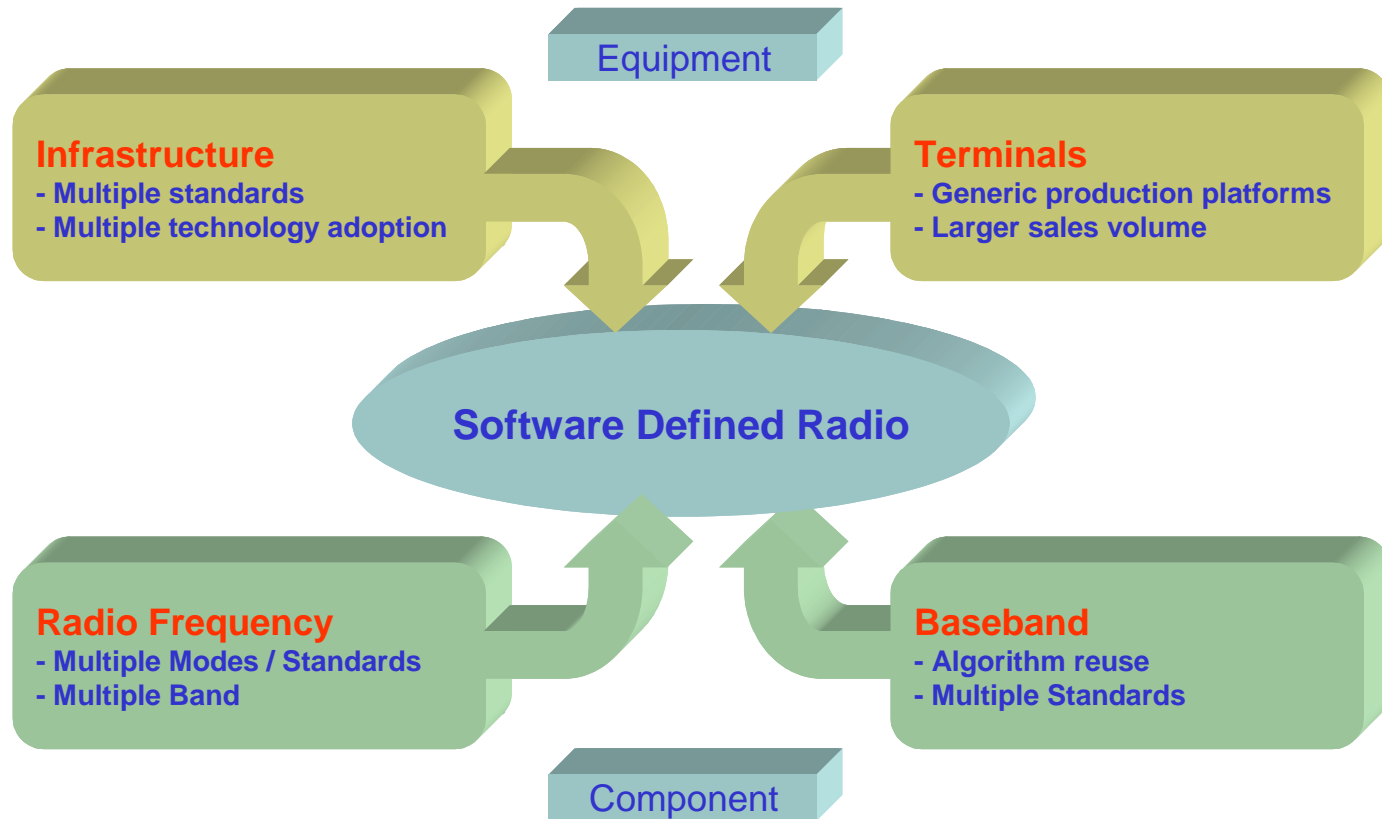Jean-Luc Valente

GM&VP

9/13/2001

radioscape

Making WAVES

About RadioScape

- Founded in late 1996
- Focused on software solutions for wireless communications
  - Multimode Baseband SoC
  - 3G & DAB
- Customers include:
  - Texas Instruments, Mitsubishi Electric, Crown Castle, Thales, NTL, Psion
- 70+ employees, 55 engineers, 13 Ph.D.

The Momentum Towards SDR

SDR Architectures

- Four SDR Application Areas are emerging
  - Defense
  - Wireless Infrastructure
  - Wireless Terminals
  - Critical Communications/Public Safety
- Significant architectural variations are emerging in these different areas
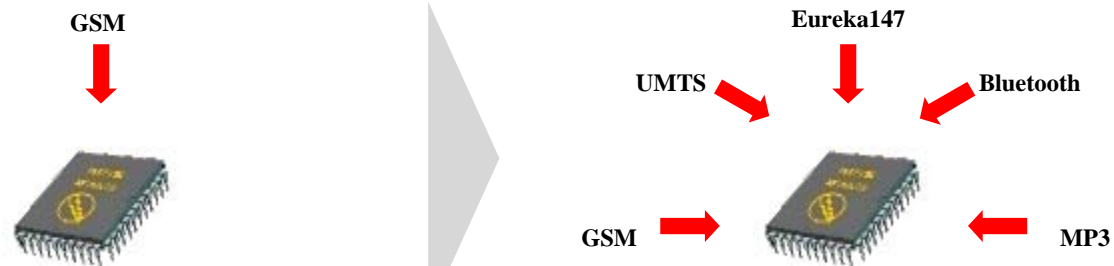
3G Performance Requires New Solutions

- With current base station performance, 3G is predicted to require a 4 to 10 X increase in basestation units to deliver full data capability, soft handoff, etc.

- Typical BTS density is currently ~ 1 per Km^2 per service provider in a given market.

- The resulting picture for 5 service providers and 4 to 10 X density is 20 to 50 basestations per Km^2
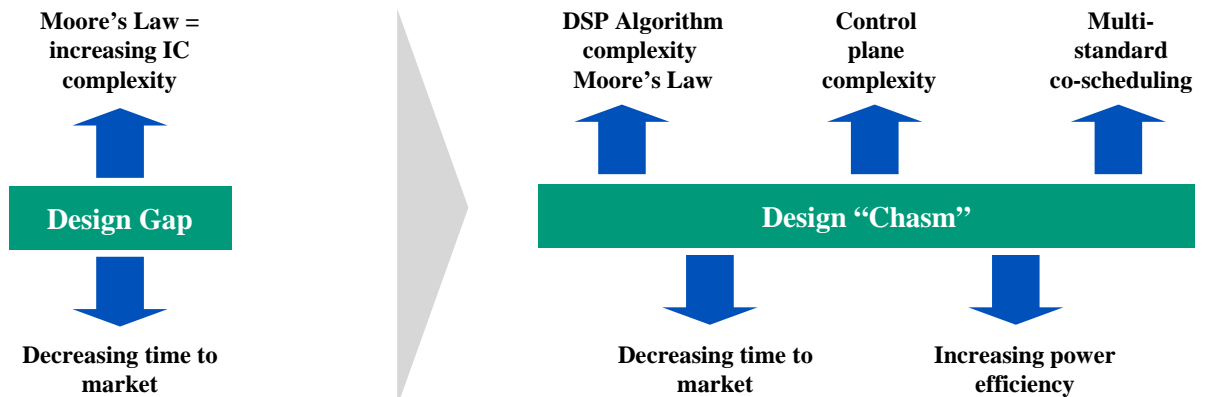
SDR: as Strong as Its Weakest Link
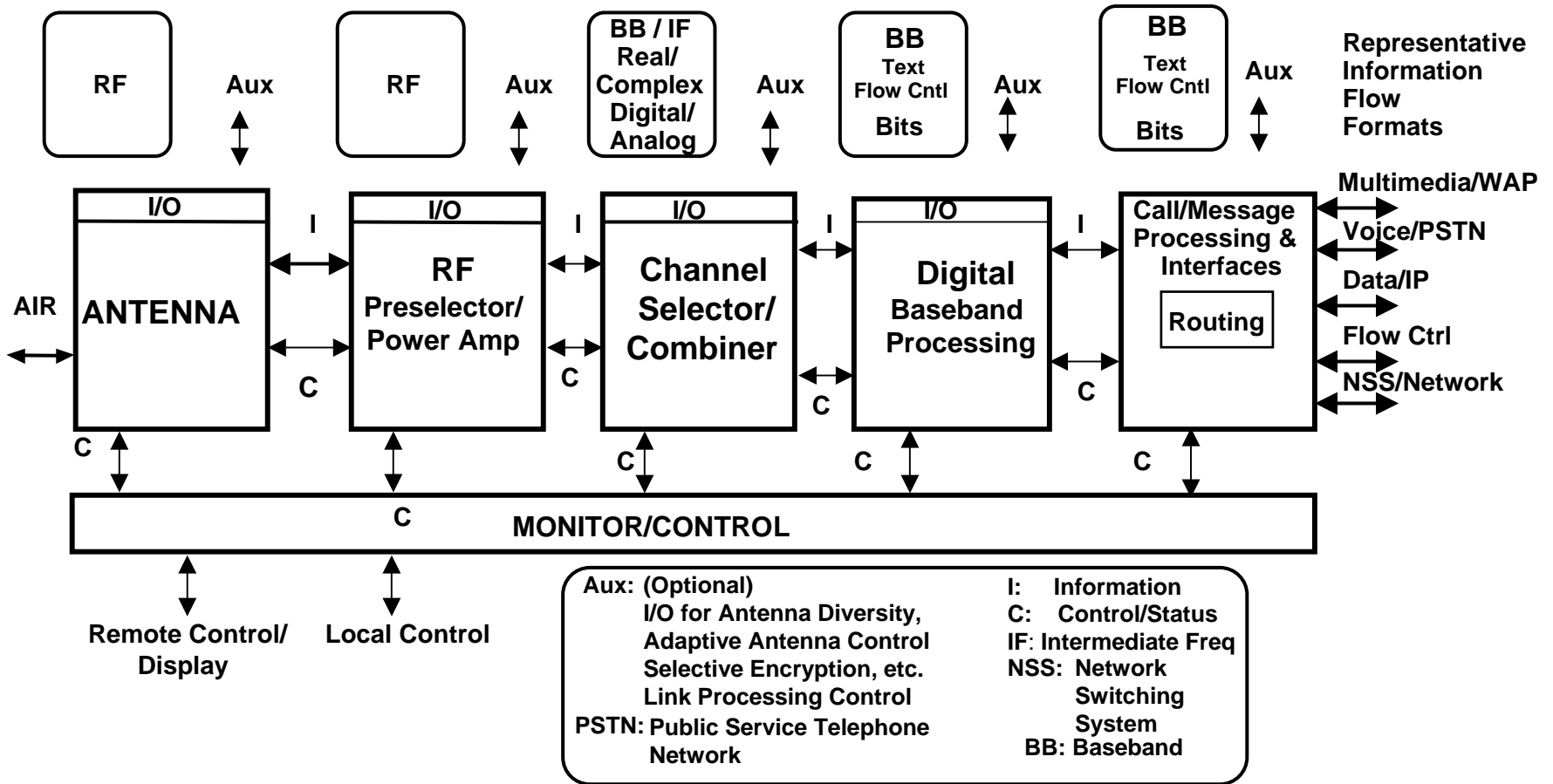
Baseband Industry Challenges

## Step change in complexity of Communications SoCs …

GSM

Eureka147

UMTS   Bluetooth

GSM   MP3

… breaks the existing SIP design paradigm

Moore's Law =
increasing IC
complexity

DSP Algorithm
complexity
Moore's Law

Control
plane
complexity

Multi-
standard
co-scheduling

Design Gap

Design "Chasm"

Decreasing time to
market

Decreasing time to
market

Increasing power
efficiency

Increased Signal Processing Load

- Internet traffic increases at a rate of 1000% per annum.

- More sophisticated signal processing algorithms must be employed to increase the effective bit per second per hertz efficiency of the underlying technology
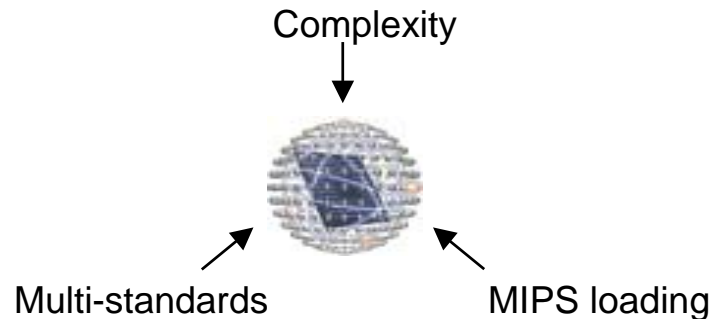
The Algorithm Gap
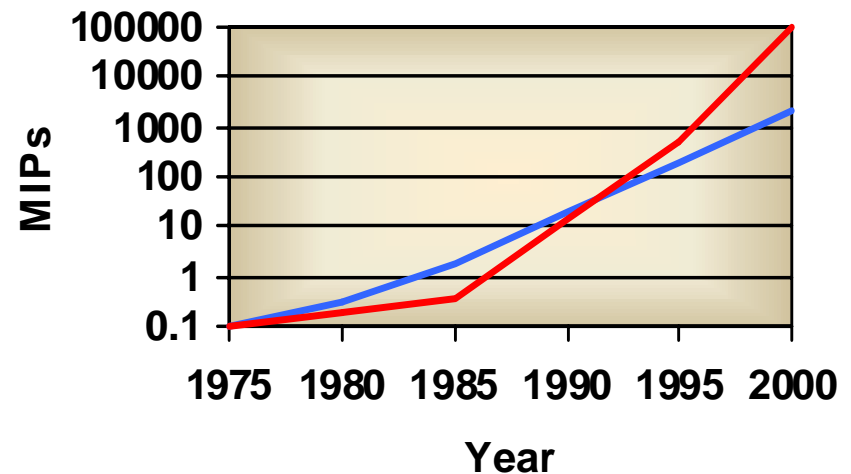
**Typical Basestation = Red, Moore's Law = Blue**

The Design Chasm

- Market drivers:

  - Pull from consumers demanding sophisticated applications

  - Push from network operators seeking ROI on spectrum

Complexity

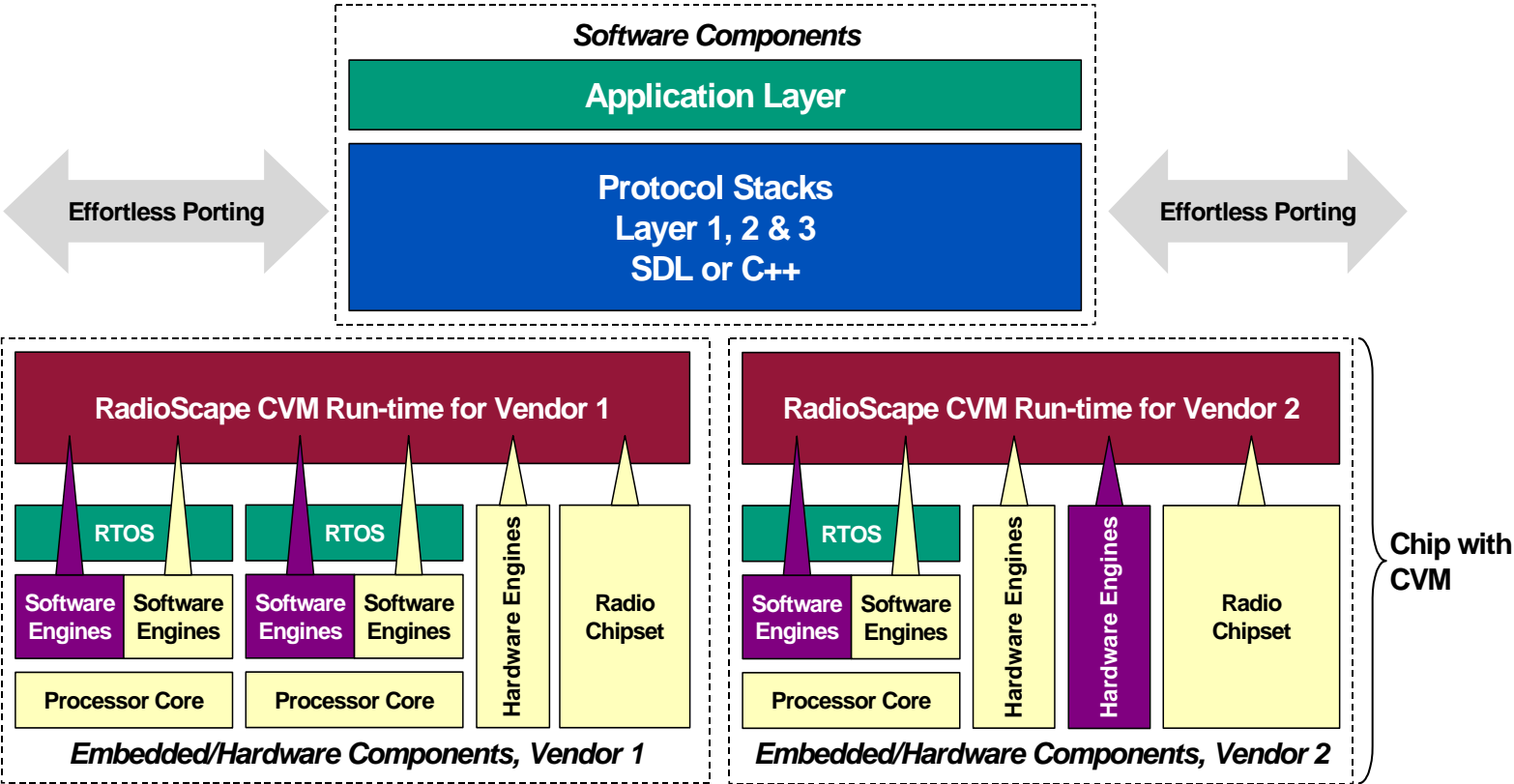Multi-standards   MIPS loading

- Manages the complexity in communications development

  - allows Multiple vendor

  - allows multiple standard (802.11, 3G, hiperLAN2)

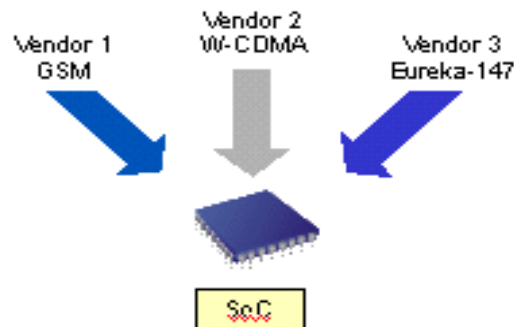 - parallel processing

Increasing HW/SW Dependencies
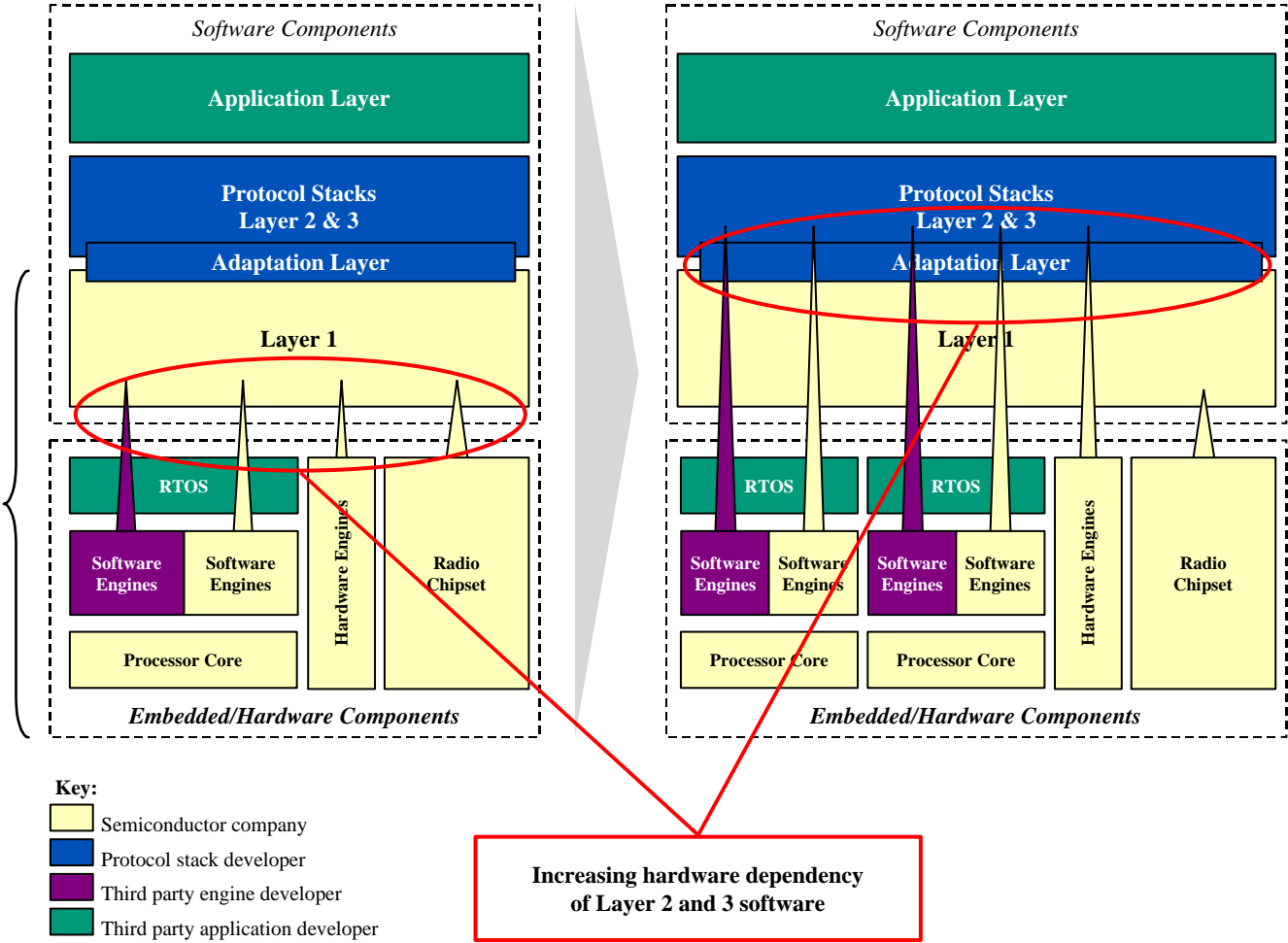
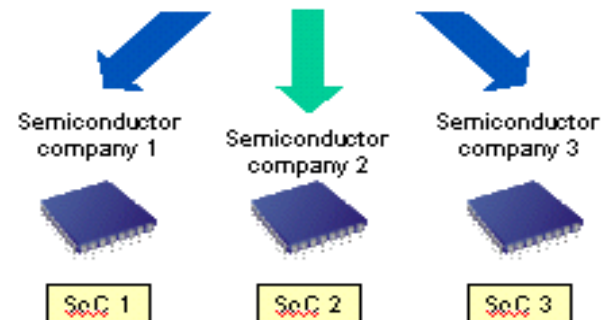# Introducing The Concept of Virtual Machine

Benefits

Semiconductor Company Benefits
Multi-mode, multi-application processor able to
incorporate IP from many independent third parties

Protocol Stack Developer Benefits
Communications standards products
(3G, Digital Radio, WLAN, etc. protocol stacks)
for many communication chip platforms

Vendor 1
GSM

Vendor 2
W-CDMA

Vendor 3
Eureka-147

SoC

Semiconductor
company 1

Semiconductor
company 2

Semiconductor
company 3

SoC 1

SoC 2

SoC 3

- **Benefits for semiconductors**
  - **Reduces complexity**
  - **Allows parallel development of chip and protocol stack**
  - **Portability of software across hardware platforms**
  - **Accelerated time-to-market**

- **Benefits for stack developers**
  - Allows development of a platform independent Layer 1
  - Co-scheduling of different IP communications standards
  - Reduces project development risk
  - Faster stack innovation cycle

Thank You!

Contacting the speaker:

@   jean-luc.valente@radioscape.com

☏   +1 650 632-4451

🖱   www.radioscape.com