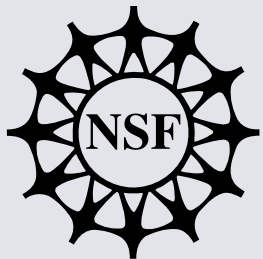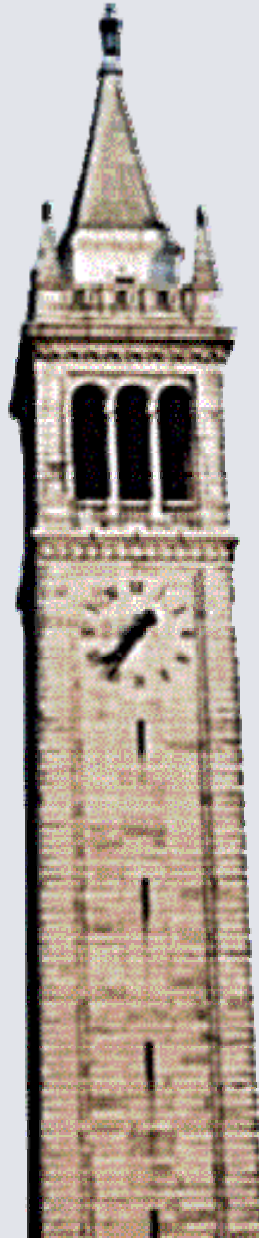# Platform Based Design for Wireless Sensor Networks

Edited and presented by

Alvise Bonivento

UC Berkeley

Chess Review
November 21, 2005
Berkeley, CA

Layers of Abstraction

Application

Sensor Network Service Platform (SNSP)

Query Service	Command Service	Localization Service	C. R. Service	Others

Rialto ⟶ ⬇ Application class, E2E Latency, Loss Rate

Sensor Network Ad-hoc Protocol Platform (SNAPP)

Randomized PicoRadio	SERAN	Others

Abstract performance ⬆   ⬇ Software generation

Sensor Network Implementation Platform (SNIP)

Mica   Telos   PicoNode   Others

Rialto
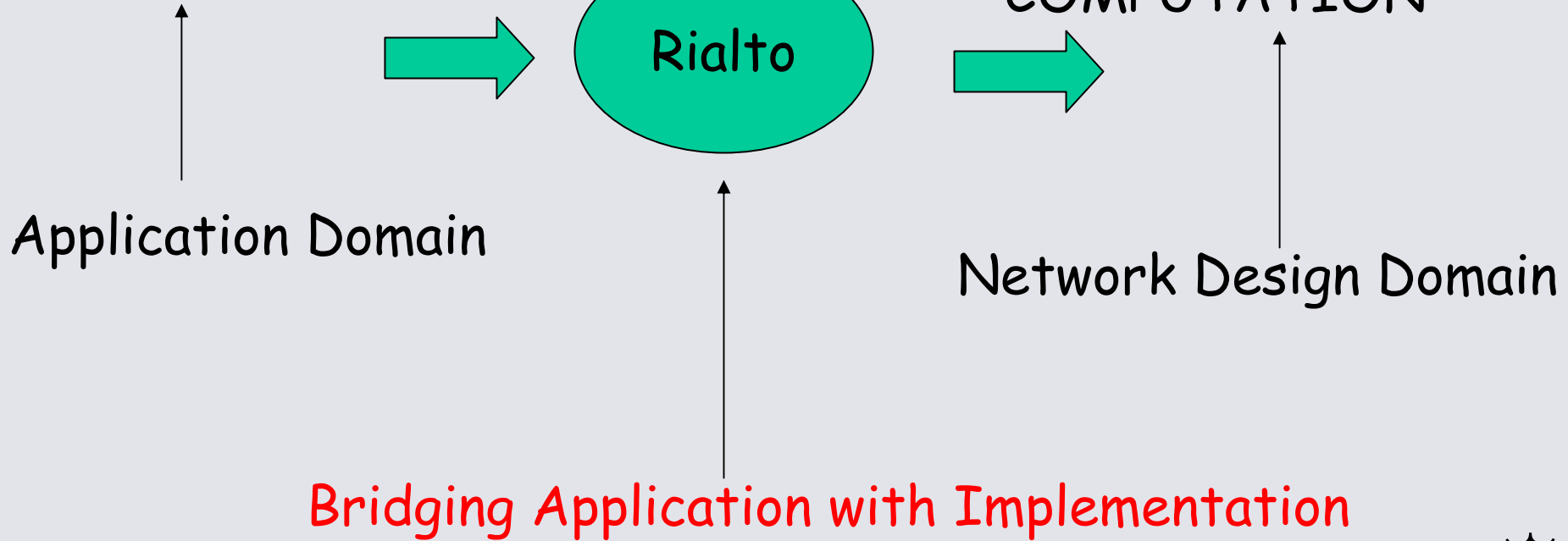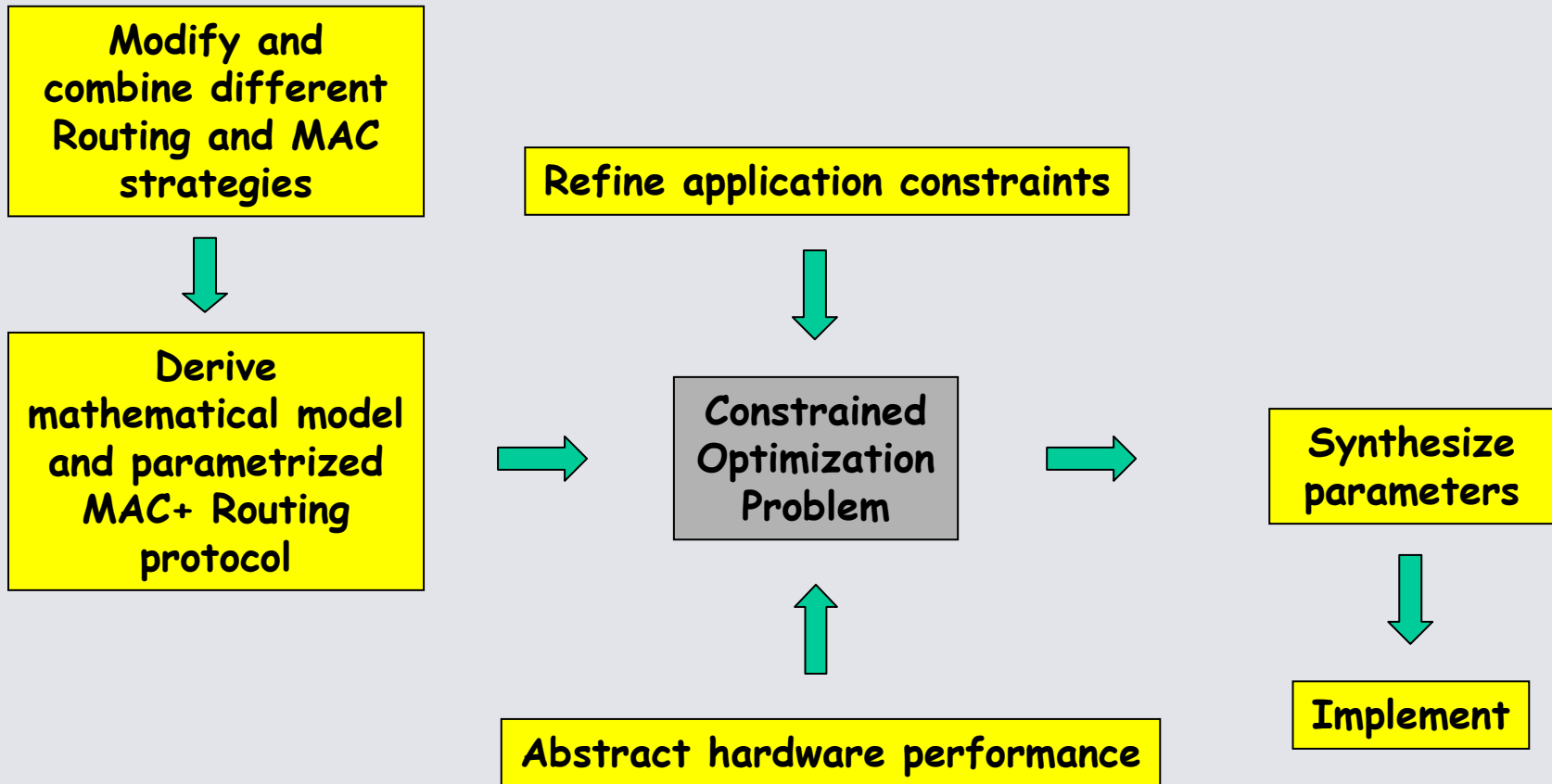
Allow user to describe the network in terms of logical components queries and services (as in SNSP)
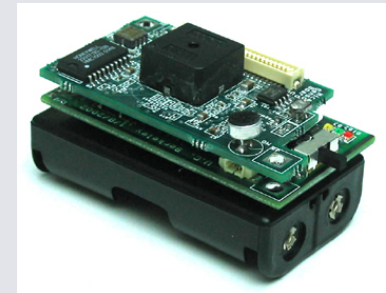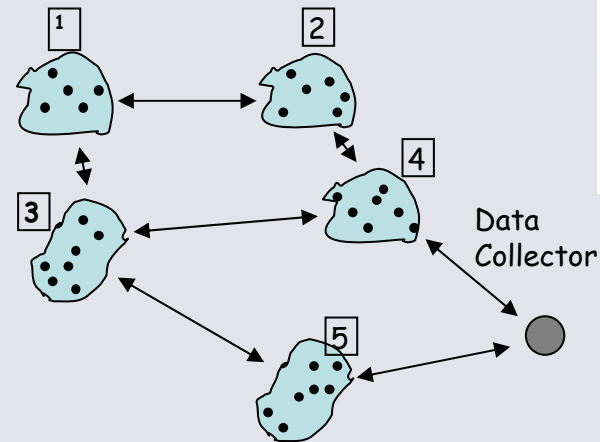
Capture these specifications and produce a set of constraints on LATENCY, ERROR RATES, SENSING, COMPUTATION

Rialto

Application Domain

Network Design Domain

Bridging Application with Implementation

Protocol Platform

```
┌─────────────────────┐
│   Modify and        │
│ combine different   │
│  Routing and MAC    │          ┌──────────────────────────────┐
│    strategies       │          │ Refine application constraints│
└─────────────────────┘          └──────────────────────────────┘
           │                                    │
           ▼                                    ▼
┌─────────────────────┐          ┌──────────────────┐          ┌──────────────┐
│      Derive         │          │   Constrained    │          │  Synthesize  │
│ mathematical model  │   ───▶   │   Optimization   │   ───▶   │  parameters  │
│ and parametrized    │          │     Problem      │          └──────────────┘
│   MAC+ Routing      │          └──────────────────┘                 │
│    protocol         │                    ▲                          ▼
└─────────────────────┘                    │                  ┌──────────────┐
                              ┌──────────────────────────────┐│  Implement   │
                              │ Abstract hardware performance │└──────────────┘
                              └──────────────────────────────┘
```

Example: SERAN

Given:
Topology
Traffic generation requirement
Delay Requirement
Target HW Platform
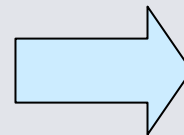
Generated:
Hybrid Routing
Hybrid MAC
Duty-Cycle
Cross-optimization

Related Work

- M. Sgroi, A. Wolisz, A. Sangiovanni-Vincentelli and J. M. Rabaey, "A Service-Based Universal Application Interface for Ad-hoc Wireless Sensor Networks", whitepaper, UC Berkeley 2004

- A.Bonivento, L.P. Carloni, A. Sangiovanni-Vincentelli, "Platform Based Design for Wireless Sensor Networks", to appear in MONET

- A. Bonivento, L.P. Carloni, A. Sangiovanni-Vincentelli, "Rialto: a Bridge between Description and Implementation of Control Algorithms for Wireless Sensor Networks", Proc. of EMSOFT 2005, Jersey City, NJ, USA, Sept. 2005

- A. Bonivento, C. Fischione, A. Sangiovanni-Vincentelli, F. Graziosi, F. Santucci, "SERAN: A Semi Random Protocol Solution for Clustered Wireless Sensor Networks", Proc. of MASS 2005, Washington D.C., Best Paper Award category Applications.

- A. Bonivento, C. Fischione, A. Sangiovanni-Vincentelli, "Randomized Protocol Stack for Ubiquitous Networks in Indoor Environment", to appear in CCNC 2006