

ESRO.ORG

Introduction To Efficient Short Remote Operations ESRO

An Infrastructure For Wireless Vertical Applications

<http://www.esro.org/>

Mohsen Banan <mohsen@neda.com>

The Concept

- Many vertical applications in the wireless environment need a Reliable, Efficient and Light Weight data transfer mechanism.
- Existing Internet transport protocols (TCP/UDP) don't address the above requirements adequately.
- Today, most vertical apps either do their own ad-hoc reliability service on top of UDP or use non-standard middle-ware.
- A reliable connection-less transport protocol based on Open Specifications is needed.
- Remote Operations is better than reliable connection-less transport as an application development paradigm.

ESRO IS IT!!!

ESRO Requirements and Goals

- **Provide reliability in an efficient manner for a wide range of vertical applications (e.g., wireless)**
- **Specify an Internet Open Protocol**
- **Minimize the number of transmissions**
- **Minimize the number of bytes transmitted**
- **Be quick: minimize latency**
- **Be Power efficient**
- **Be light weight -- accommodate miniaturized devices**

Typical Wireless Application

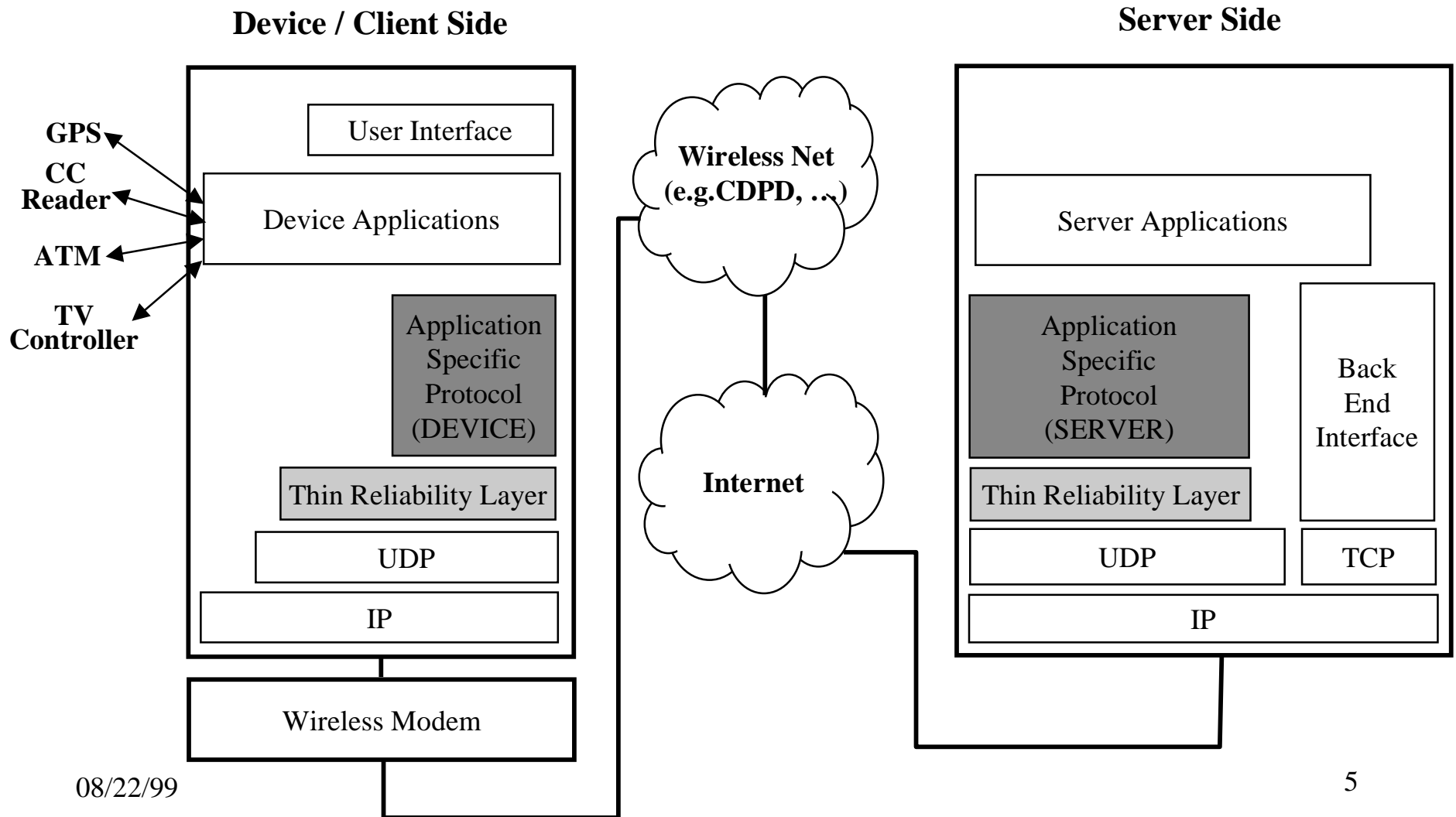
Vertical Apps

- Wireless Credit Card verification
- Wireless Automated Teller Machine (ATM)
- Dispatch Applications
- Wireless Inventory Management
- Telemetry
- Wireless T.V. Ratings
- Vehicle tracking (GPS Apps ...)
- ...

Horizontal Apps

- Two-Way Paging -- Wireless Messaging -- EMSD
- White Pages (Directory) look-ups
- Dictionary look ups
- Micro Browsers
- ...

Anatomy Of A Wireless Vertical Application



Middleware For Wireless-IP?

**The Scope Of Middleware For
Wireless-IP is beyond Wireless-IP.**

**Efficiency is not a Wireless-Network
specific problem.**

We need protocols not middleware!

ESRO vs. Other Existing Protocols

- **TCP** -- too much
- **UDP** -- too little
- **Remote Procedure Call (RPC)** -- too informal
- **Transaction TCP T/TCP** -- too Complex and too heavy
- **WAP's WTP** -- closed club, not open enough
- ...

ESRO Protocol Specification

- **Completely OPEN Protocol Specification**
No Copyright, No Known Patents, No IPRs
- **Published As An Internet RFC:**

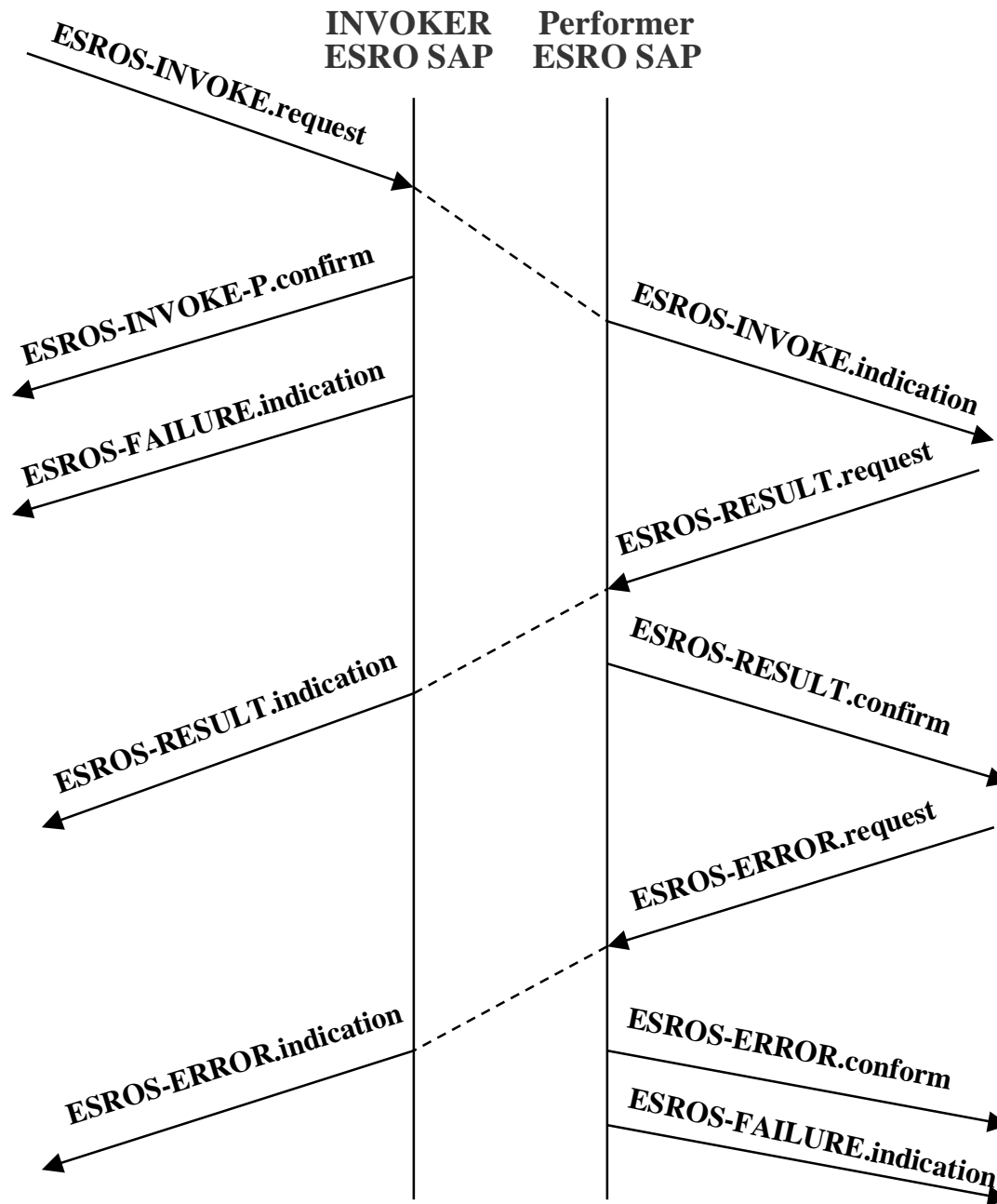
RFC-2188 -- ESRO

- **ESRO.ORG :**
**Support In Place For Maintenance, Enhancement
and Evolution of ESRO Protocol**
- **<http://www.esro.org>**

ESRO Service Definition

- **Remote Operations Is Better Than Reliable Connection-Less Transport As a Paradigm For Application Development**
- **RFC-2188 Includes A Formal Service Definition**
- **RFC-2188 Includes A Formal Notation for expression of Operations**
- **An Operation Consists Of:
Operation Id, Argument, Result/Error**

Efficient Short Remote Operations Services



ESRO Service Interface (API)

- **Published and completely OPEN**
- **Supports direct function call as well as call-back paradigms**
- **Fully consistent with the Service Definition**
- **C and C++ language bindings**
- **Simple and easy to use. Lots of examples.**
- **Freely available through:**
<http://www.esro.org/>

Use Of ESRO

- **Encoding Of Application Specific Information**
 - Plain Text, ASN.1 (BER, PER, ...), XDR, Ad-hoc
- **Operation Execution Reliability**
 - 2-Way Handshake, 3-Way, 3-Way with Verify
- **Idempotent or Not**
 - duplicate detection
- **Error Detection -- Re-tries -- Spooling -- Err Notif**
- **Segmentation/Re-assembly -- Concatenation/Separation**

Overview Of ESRO Protocol

- **Service Definition**
- **Service Notation**
- **2-Way Hand Shake State Machine**
- **3-Way Hand Shake State Machine**
 - SAP addressing
 - Re-transmission policies
 - Reference number assignments
 - Congestion Control

ESRO Software

Reference Implementation

- **Licensing**
- **Device Source Availability**
- **Device Binary Availability**
- **Device Development Toolkit**
- **Server Source Availability**
- **Server Binary Availability**

ESRO Software -- Supported Platforms

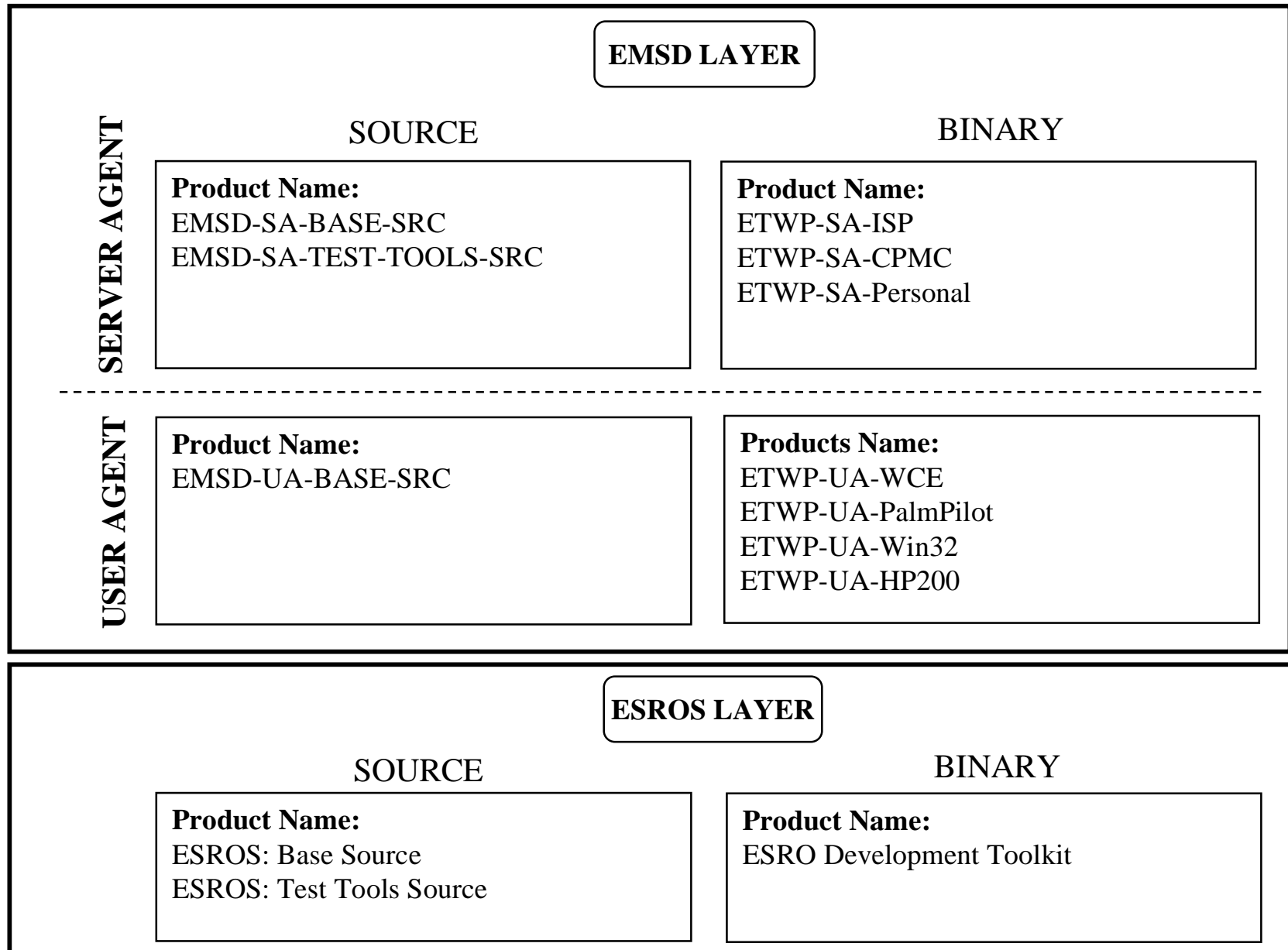
Device Side

- Embedded Systems -- Source (Port Neda's EROP Toolkit)
- Embedded Systems -- Binary
 - eCos (soon)
- WindowsCE -- Available Now
- Windows 95/98 -- available now
- Windows NT -- available now
- PalmPilot -- soon
- EPOC -- soon

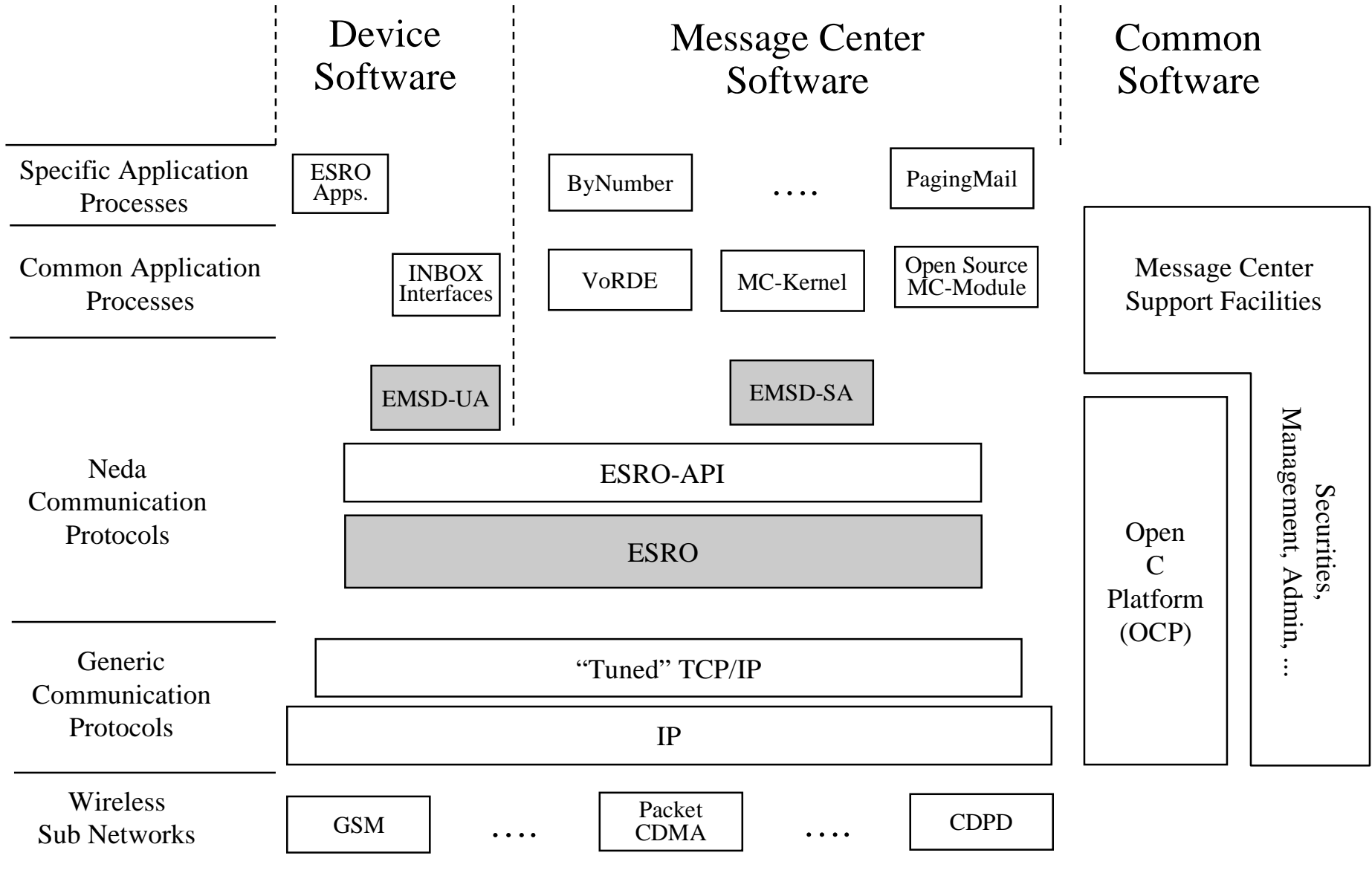
Server Side

- Solaris -- available now
- Linux -- available now
- Win NT -- available now
- Custom

Neda Products Map



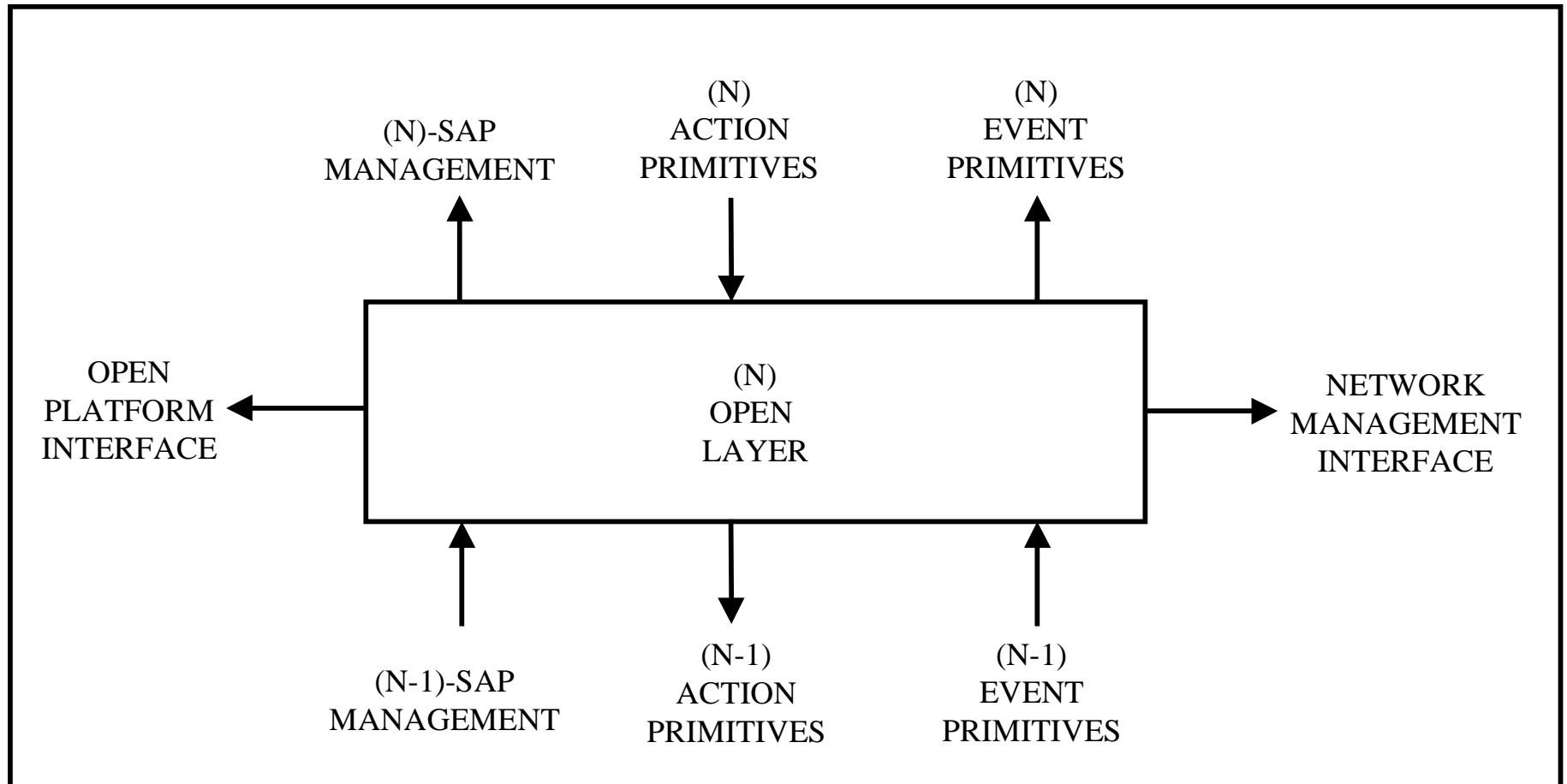
Neda Software Architecture



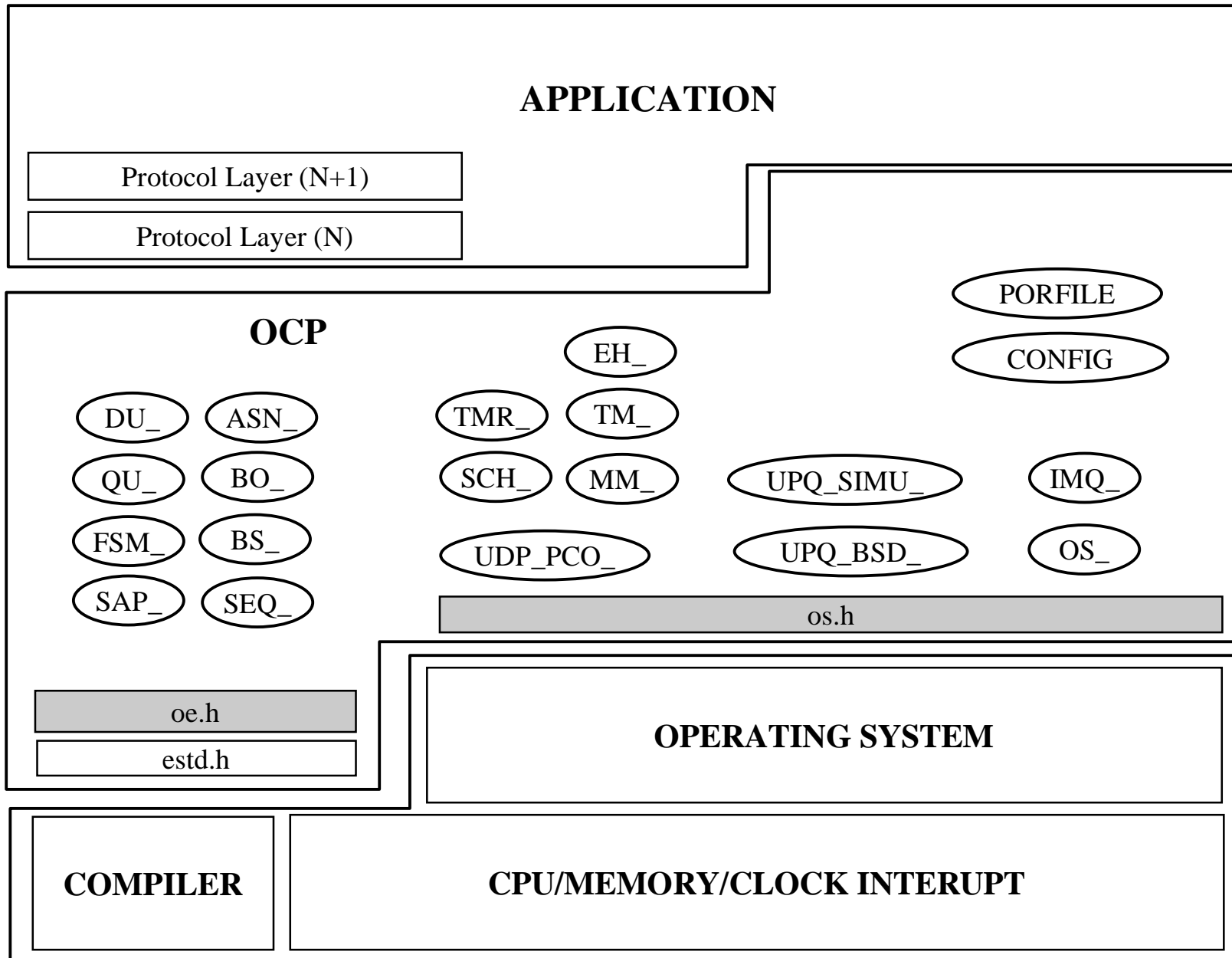
Open C Platform (OCP)

- **A Thin Operating Environment Virtualization Layer.**
- **Open Source -- Subject to GPL.**
- **Lot Of Support For Data Comm. Protocol Development.**
 - Timer management, PDU and buffer management, Service Access Point Management, consistent stackable comm. Layers, Finite State Machines, ...
- **Lots of General Software Development Facilities**
 - Error Handling, Configuration Management, Logging, Tracing, ...
- **Support For Many Target Environments**
 - Embedded Boards (eCos), WinCE, Windows 95/98, NT, Solaris, Linux, ...
- **Support For Many Development Environments**
 - Solaris and Linux (gcc, gdb, cvs, ...) , NT (MS-DevStudio)
- **Complete Documentation -- Publicly Available**

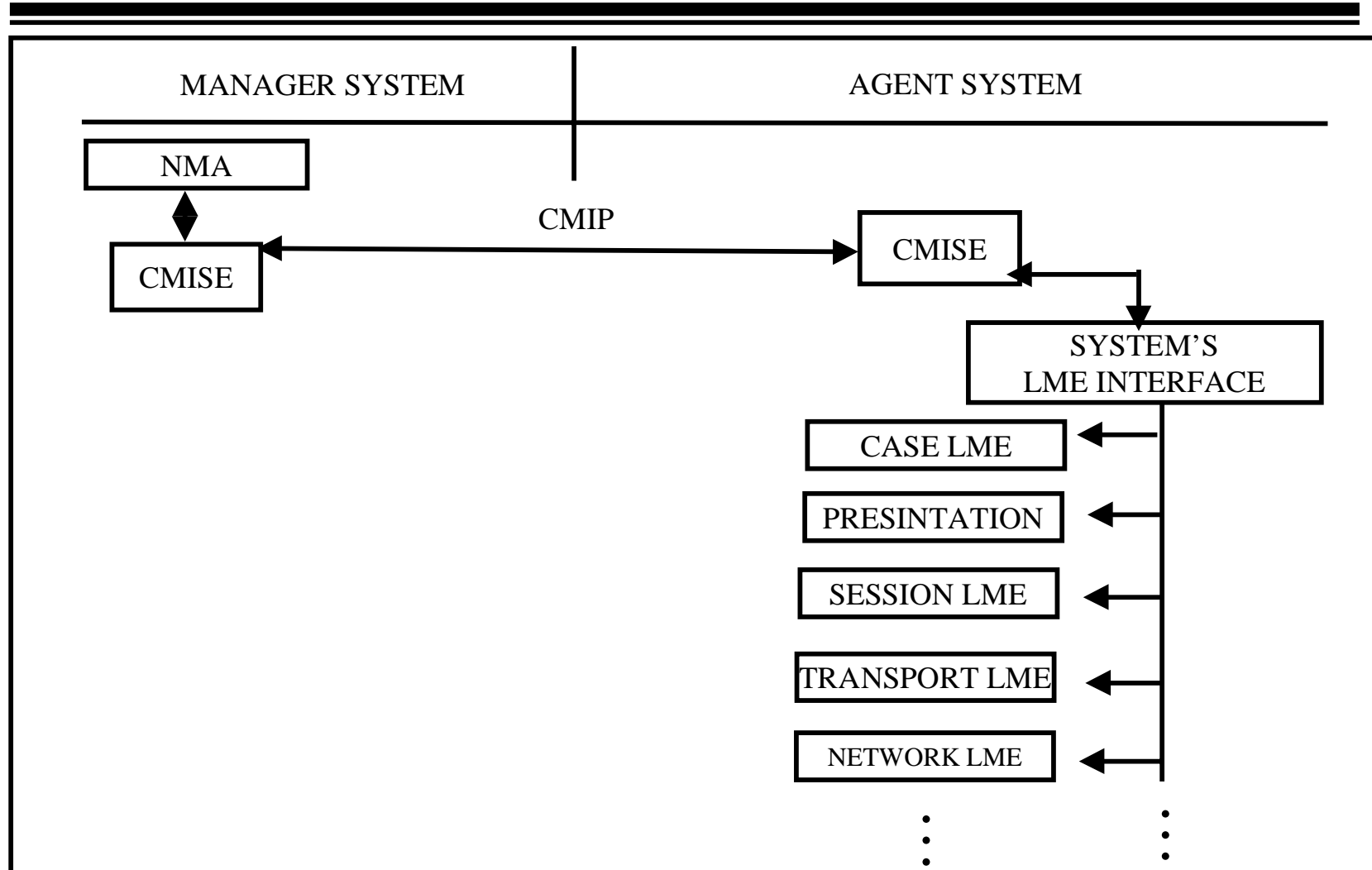
Architecture Of An OCP Layer



Where OCP Fits



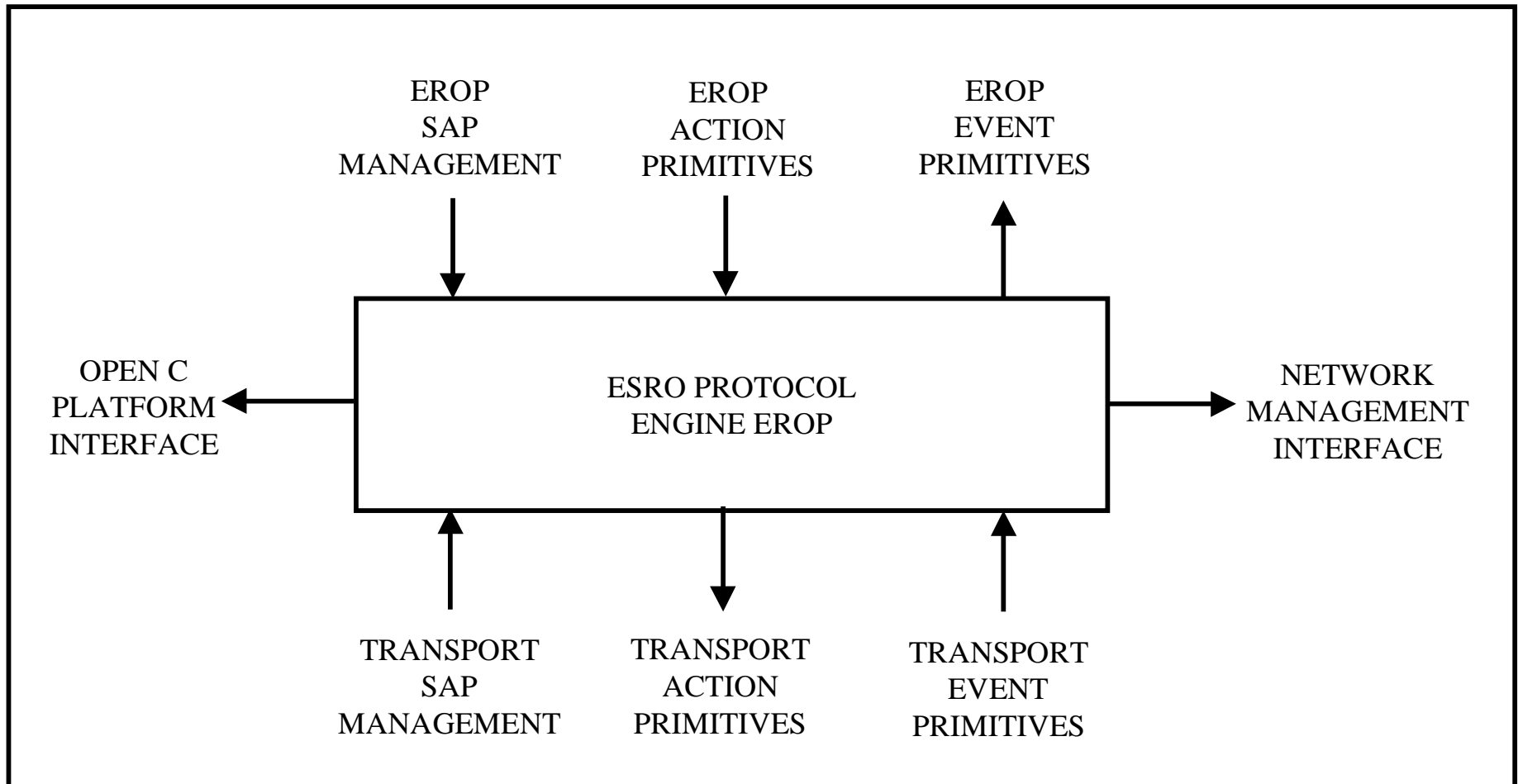
OCP's Systems Management Architecture



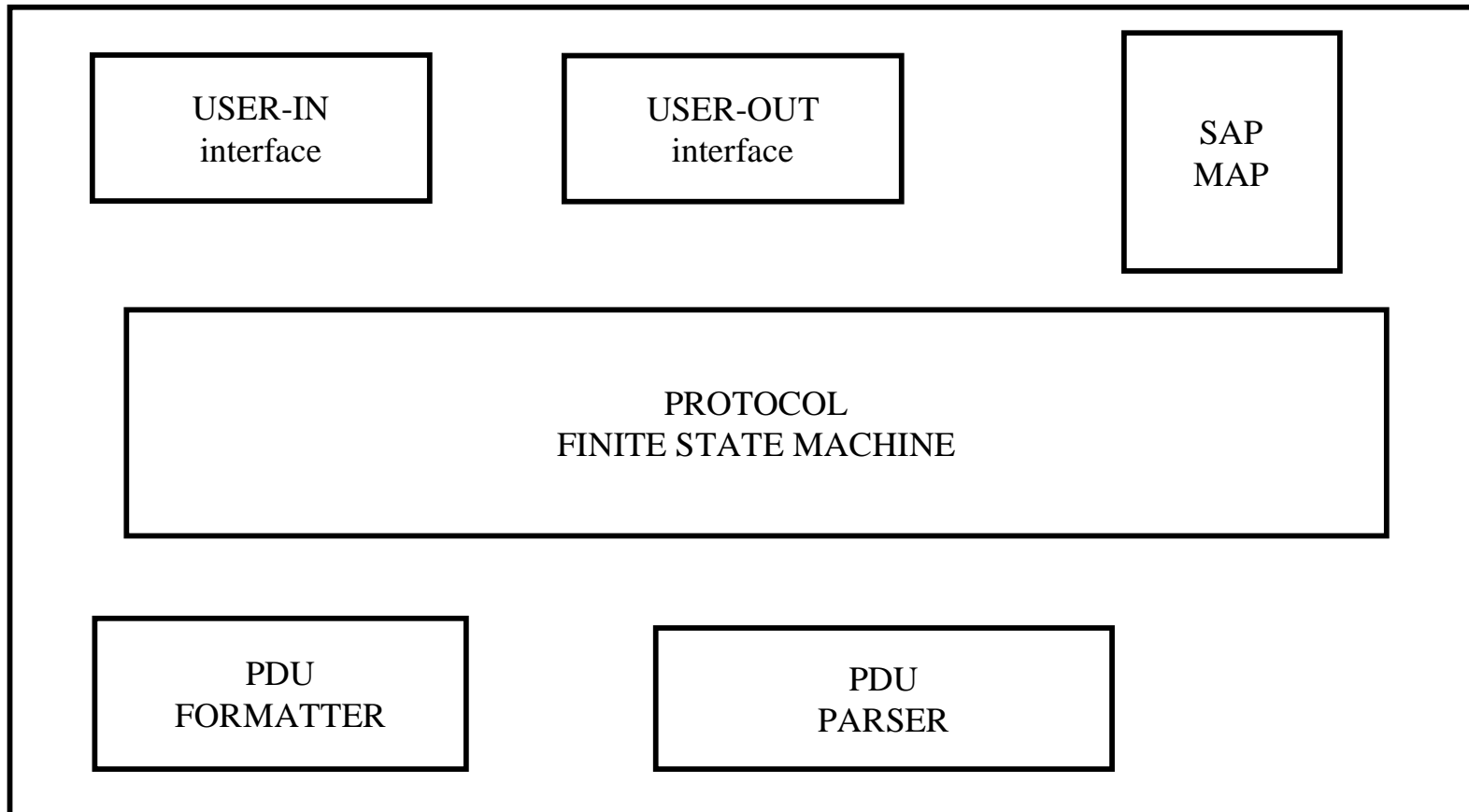
Neda's ERQP -- A Reference Implementation of ESRO Protocol

- **Open Source**
- **Fully Documented**
- **Tailorable for Both Device and Server Side Usage**
- **Development Toolkit Includes:**
 - PDU analyzer, stress tester, regression tester,...

NEDA'S EROP MODULE and its interfaces



EROP Modules



Wireless Vertical Application Development Considerations

- **Main Problem: It Is Multi-Disciplinary:**
 - Need Application Domain Specific knowledge
 - Need Data Communication Expertise
 - Need Wireless Network Expertise
 - Need Software Development Expertise
 - Need Deployment and Operational Expertise
- **Always favor “Buy”, in Build vs Buy situations**
- **OPEN always wins over closed in Data-Comm.**
- **Stay in the mainstream.**
- **Internet RULES. Make it Internet native.**

(A) Stepwise Example Of Commercial Wireless App Dev. Process With ESRO

- **Verify That ESRO's Services and Paradigm is the Right Fit For Your Application**
- **Choose the right Wireless Network For Your Application (e.g., CDPD).**
- **Choose the right Wireless Modem for your Application (e.g., Sierra Wireless, Novatel).**
- **For the device side, get the Open Source ESRO Software from esro.org or license the professional supported version from Neda or your modem manufacturer**

(B) Stepwise Example Of Commercial Wireless App Dev. Process With ESRO

- **For the server side, decide on your choice of the platform. Get the Open Source ESRO Software from esro.org or license the professional supported version from Neda for Solaris, Linux or NT.**
- **Design your application on top of ESRO.**
- **If needed, verify health of your design by getting help from data-comm experts (e.g., Neda).**
- **Use the supplied examples as a starting point for your implementation**

Example of An Operation

```
-- RCS: $Id: EMSD-sdp.ry,v 1.2 1995/02/05 09:18:19 mohsen Exp $

EMSD-SubmissionAnddeliveryProtocol DEFINITIONS ::=
BEGIN

-- EXPORTS ProtocolVersionNumber, EMSDORAddress, AsciiPrintableString

-----
-- SUBMIT Operation --
-----

submit LS-OPERATION
  ARGUMENT SubmitArgument
  RESULT SubmitResult
  ERRORS
  {
    submissionControlViolated,
    securityError
  } ::= 1
```

EMSDP Delivery Trace

DELIVERY

IP_PDU	UA	MailServer	DATA	UDP	IP
1	UDP	.<--Invoke header+body --- .	299	307	327
2	UDP	. -----Response ----->.	2	10	30
3	UDP	.<----- Ack ----- .	2	10	30