



# JAMAP: a Web-Based Management Platform for IP Networks

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# Outline

- Problem statement
- Solution:
  - Web-based management
  - push technologies
- Overview of JAMAP
- Conclusion

# Problems with SNMP-Based NMPs

- For customers:
  - too expensive (hardware and software)
  - limited support for third-party RDBMSs
  - investment bound to processor & OS
- For network equipment vendors:
  - add-ons (i.e. device-specific mgmt GUIs) cost too much:
    - many NMPs, many OSs, and many add-ons
- For customers and network equipment vendors:
  - poor time-to-market for add-ons, depending on market share
  - MIB versioning

# Problems with SNMP

- SNMP expertise is rare and expensive
- Scalability, network overhead and latency are adversely affected by some early protocol-design decisions (late 1980s):
  - BER encoding, SNMP table retrieval, OIDs are verbose, no compress.
- Low-level semantics
- Security
- Unreliable transport protocol
- Poor distribution
- Evolution hampered by legacy systems:
  - “better replace than repair”

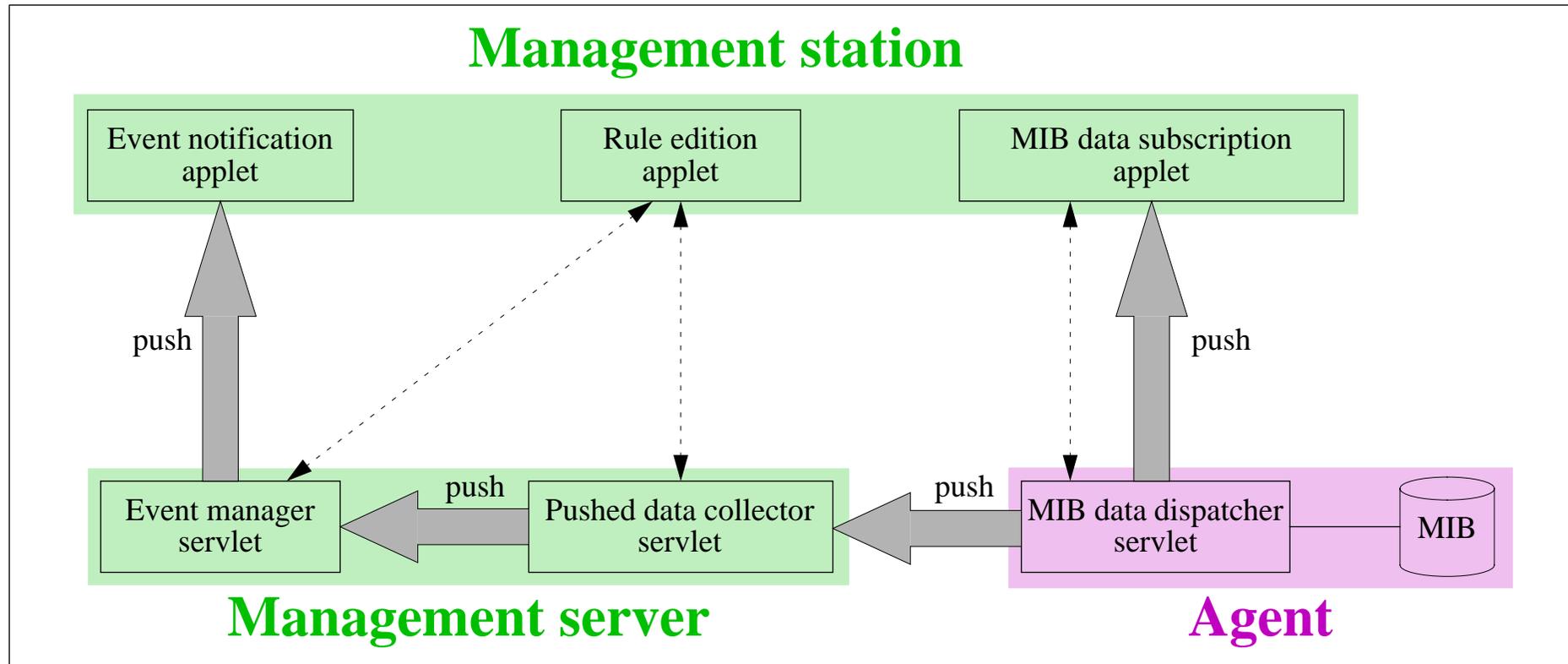
# Proposed Solution (1/2)

- Keep:
  - MIBs
  - organizational model
- Change management framework:
  - for repetitive tasks: pull model --> push model
  - move some workload from the manager to the agents (à la MbD)
- Change communication model:
  - SNMP --> HTTP
  - connectionless UDP --> persistent TCP connections
  - gzip compression
  - unlimited number of MIB variables per push cycle
  - BER encoding --> MIME parts + {strings, XML, ser. Java objects...}
  - natural table retrievals

## Proposed Solution (2/2)

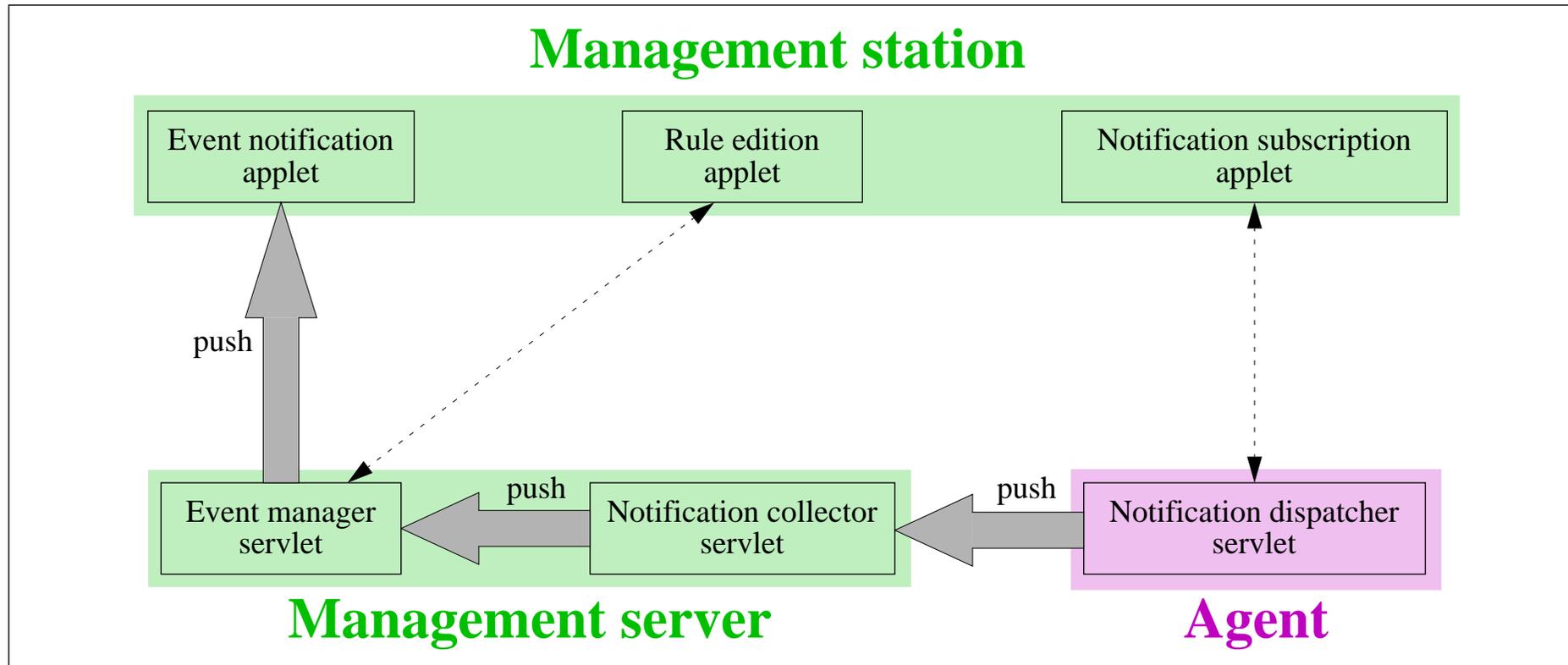
- Change NMP:
  - split manager (2-tier --> 3-tier architecture):
    - ▣ management server (Java servlets)
    - ▣ management station (Web browser)
  - rewrite manager code --> Java servlets indep. of OS and processor, no RDBMS-specific glue code
  - rewrite add-ons --> Java applets
  - support any third-party RDBMS via JDBC
  - distribution made easier:
    - ▣ manager: monolithic NMP --> distributed servlets
    - ▣ manager to agent: mobile code
    - ▣ manager to manager: standard distributed Java application

# JAMAP: Monitoring and Data Collection

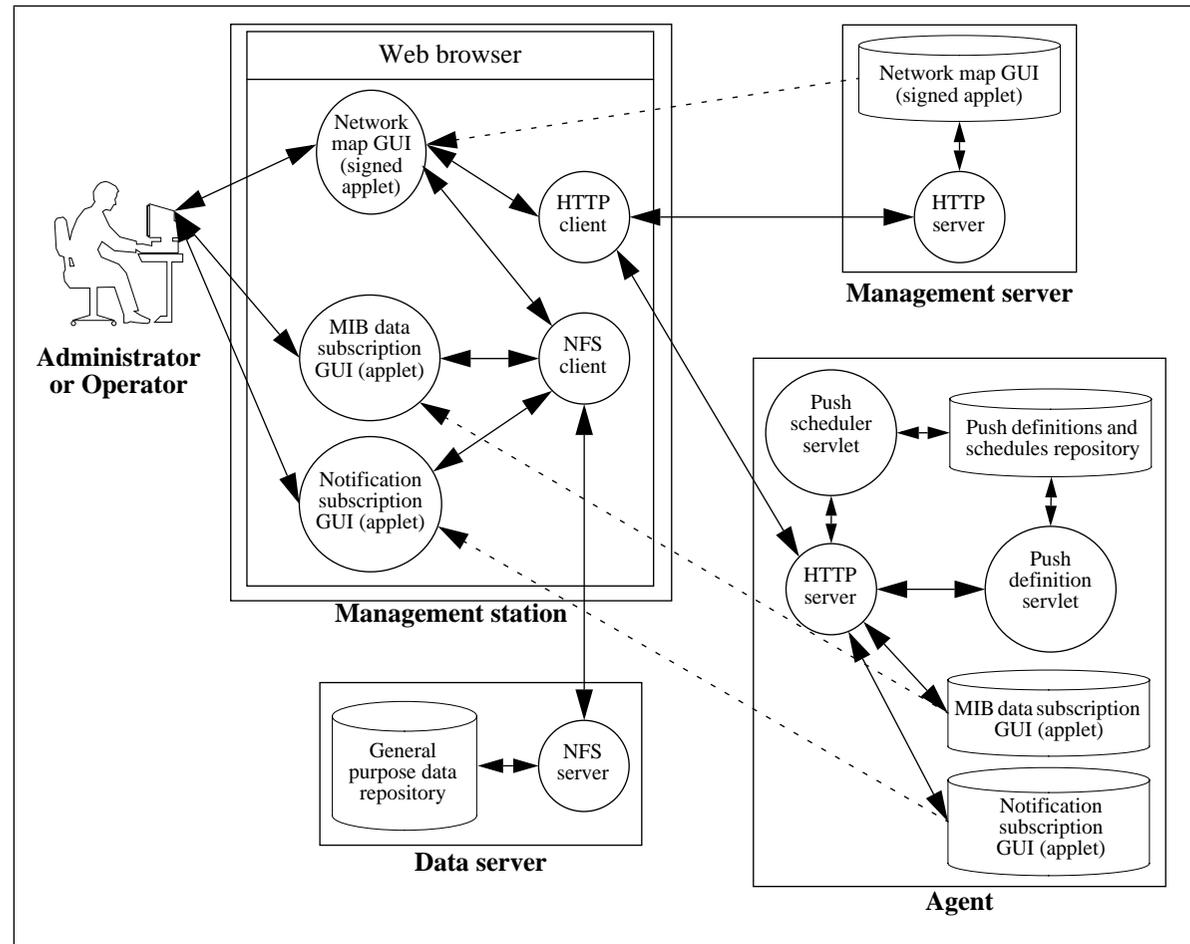


JAMAP = JAva MAnagement Platform

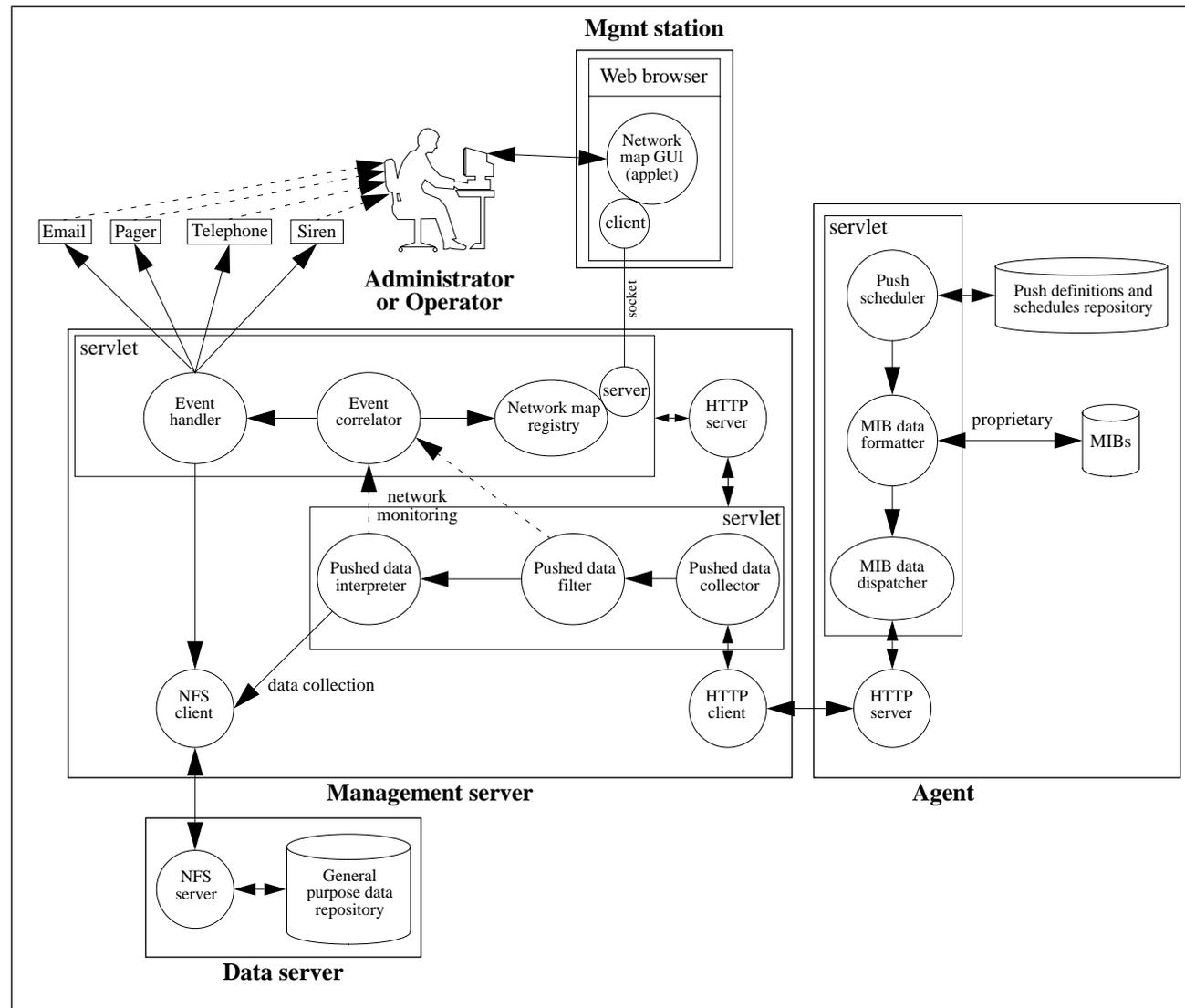
# JAMAP: Notifications



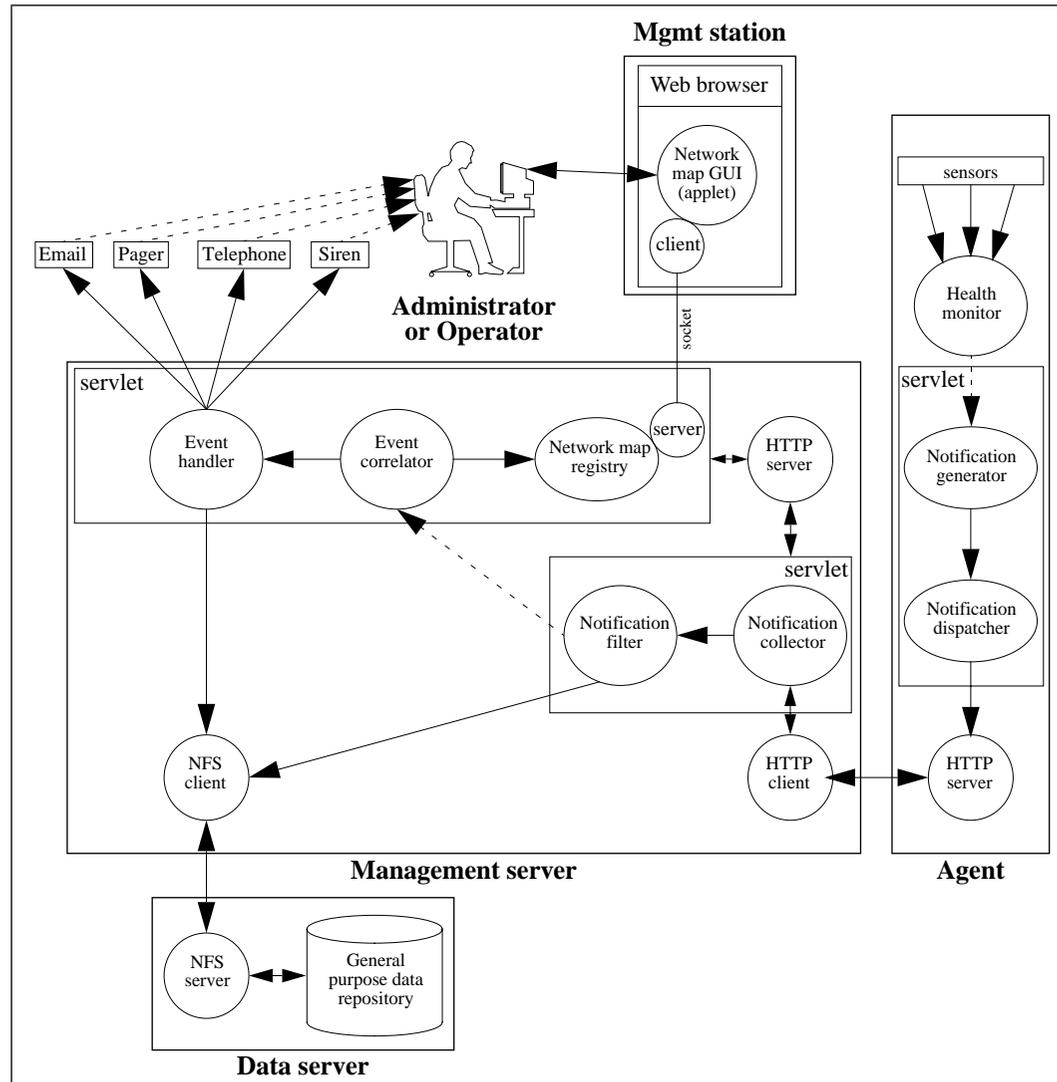
# Publication and Subscription



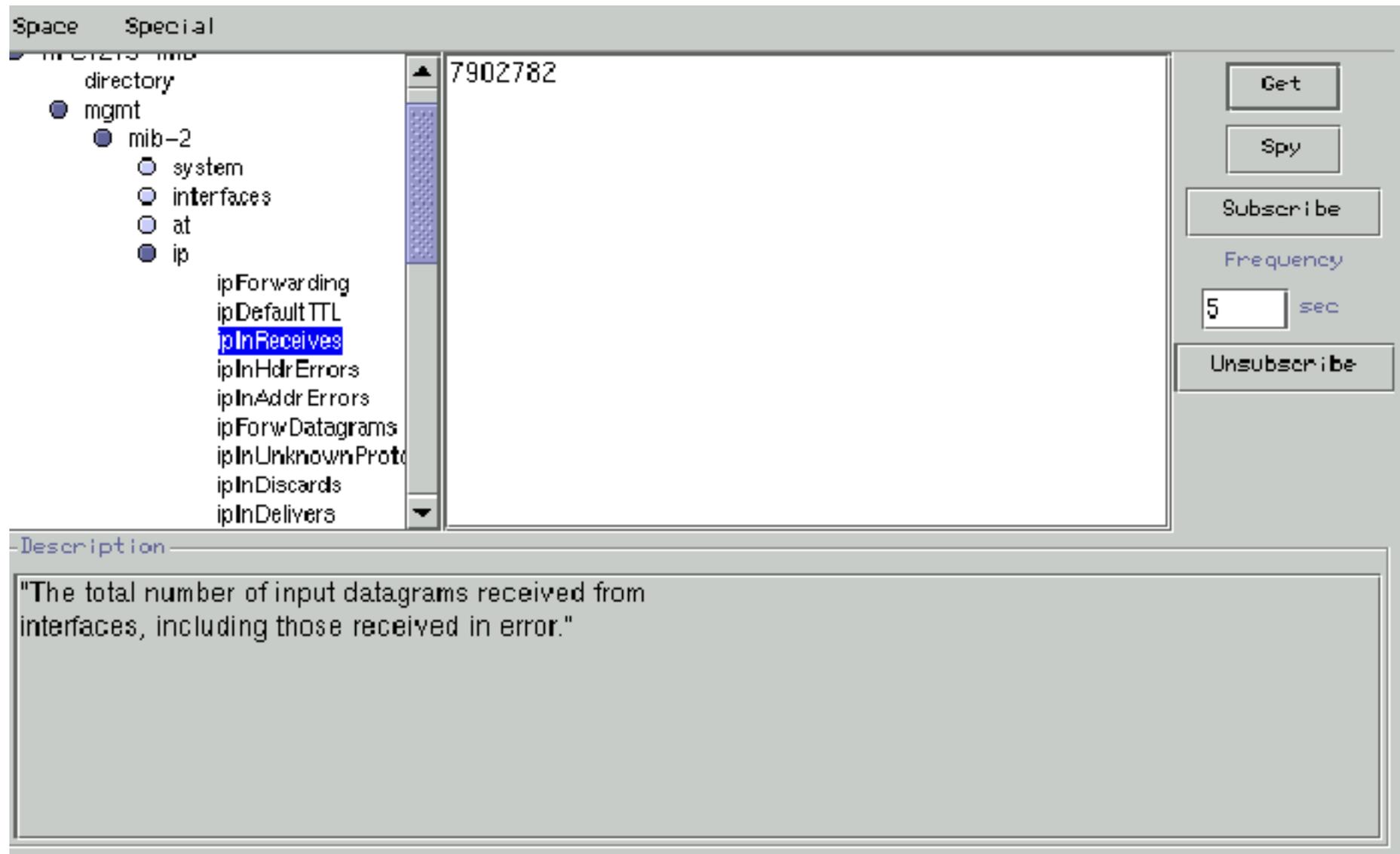
# Push-Based Distribution for Monitoring and Data Collection



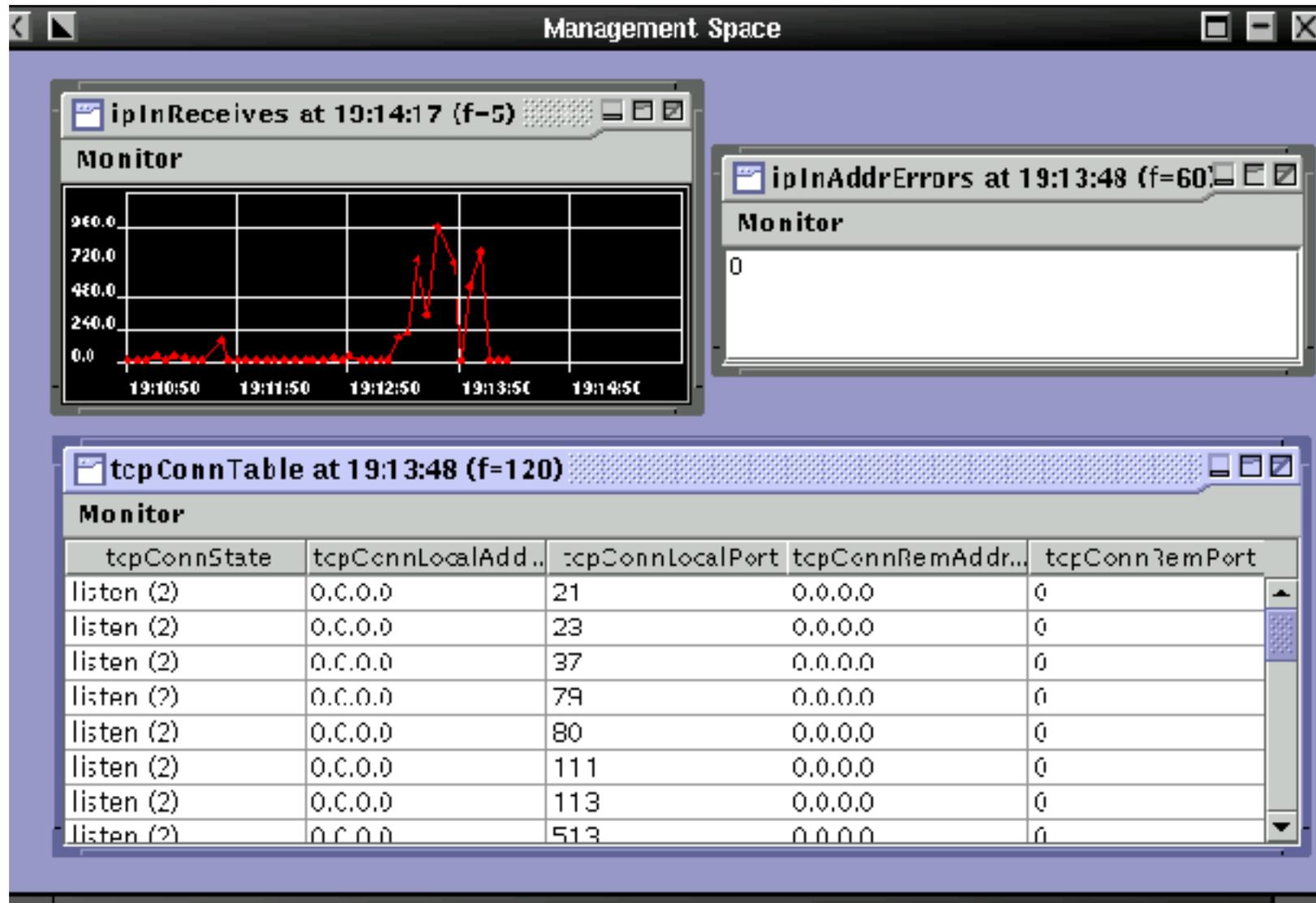
# Push-Based Distribution for Notifications



# MIB Data Subscription GUI



# Interactive Monitoring GUIs



# Rule Edition GUI

The screenshot displays the Rule Edition GUI with the following components:

- Tree View (Left):** A hierarchical list of rules. The 'tcp' rule is selected, and 'tcpCurrEstab' is highlighted within it.
- Rule Java Source (Top Right):** A code editor containing the following Java code:
 

```
public class MibDataRule:cap36_epfl_ch_1_3_6_1_2_1_6_9 extends MibDataRule
{
    public void apply(SnmpVar var){
        Long n = (Long)var.toValue();
        if (n.longValue() > 500)
            generateEvent("MIBFRFI 0W", "Too much connections", n, "WarningHandler");
    }
}
```
- Dialog (Middle Right):** A window showing the output of a compilation process:
 

```
Data collector connected to icapc36.epfl.ch
jmap/server:rule.MibDataRule:cap36_epfl_ch_1_3_6_1_2_1_6_9 ava:10: Incompatible ty
    Long n = var.toValue();
    ^
1 error
Rule successfully compiled
```
- Description (Bottom):** A text area containing the description: "The number of TCP connections for which the current state is either ESTABLISHED or CLOSE-WAIT."
- Agent Address:** A text field containing 'icapc36.epfl.ch'.
- Templates:** A list box showing 'MibData' and 'String'.
- Buttons:** 'Reconnect', 'Reinit', 'Load', 'Submit Rule', and 'Load'.

## Related Work

- WBEM initiative by the DMTF:
  - CIM information model
  - HTTP
  - XML
- Java RMI camp:
  - Sun's Jini and JMX
  - Marvel by Anerousis
- Web-based management raises much interest from the industry:
  - <http://www.mindspring.com/~jlindsay/webbased.html>

## Summary: What Do We Gain?

What do we gain by going from SNMP-based pull to Java-based push to manage IP networks?

- Reduce the development costs of managers & add-ons
- Make site customization easier
- Reduce network overhead of mgmt data
- Zero the time-to-market of add-ons (embedded)
- Put small and large equipment vendors in fair competition w.r.t. mgmt
- Improve the support for third-party RDBMSs
- Simplify the mgmt of remote subsidiaries across a firewall

# Summary: What Does It Cost?

What does it cost to go from SNMP-based pull to Java-based push to manage IP networks?

- network equipment vendors must add software and hardware to their equipment:
  - ▣ HTTP server (usually done today), push system, scheduling system, JVM
  - ▣ CPU power, memory, EPROM (optional)
- administrators must synchronize the clocks of the managers and the agents (e.g. with NTP)
- we need professional-grade software for the mgmt server:
  - ▣ more and more vendors are coming in the Web-based management market

# Current and Future Work

- Design patterns:
  - SNMP management revisited with an OO software-engineering cap
- XML:
  - Portable: generic serialization of the state of an object:
    - independent of Java
    - typical use: agent with no JVM
  - Flexible: can deal with SNMP MIBs, OSI MITs, CIM, etc.
    - more flexible than CIM gateways
    - do we need CIM?