# Toward Configurable Performance Monitoring
## Introduction to Mathematical Support for Metric Representation and Instrumentation of the CIM Metric Model

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- Context and Issues
- Our Proposal: a Monitoring Architecture for Management and QoS Purposes
- Information Model
- Added Value and Future Works

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- <span style="color:red">Context and Issues</span>
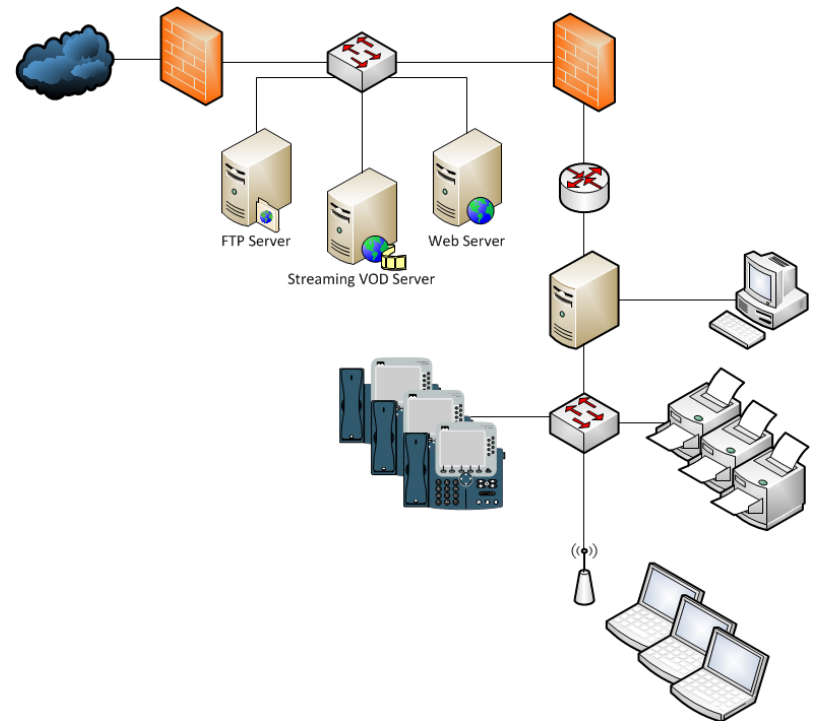  - <span style="color:red">Context.</span>
  - <span style="color:red">Issues: Characteristics & Existing Projects Lacks.</span>
- Our Proposal: a Monitoring Architecture for Management and QoS Purposes
- Information Model
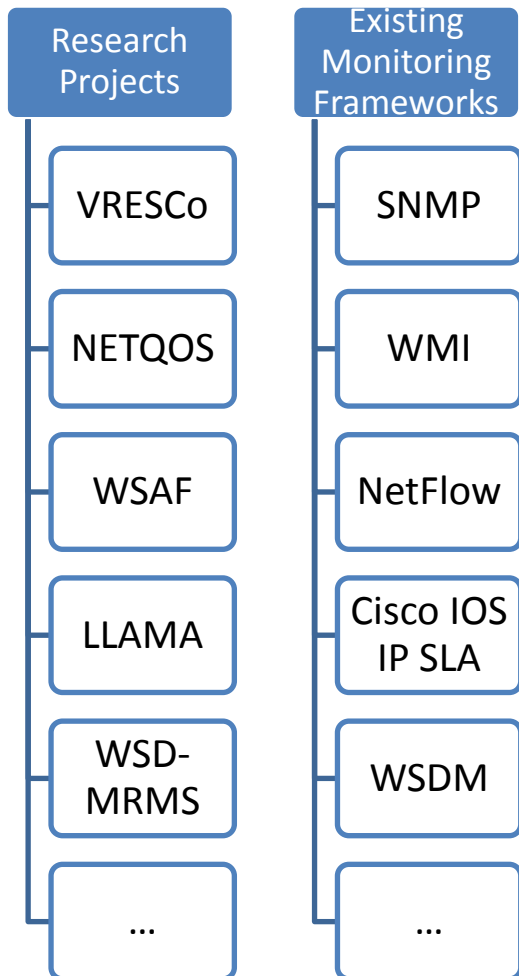- Added Value and Future Works

# Context

- SOA (Service-Oriented Architecture).

- Guarantee a certain level of the QoS committed during run time.

- Management and QoS treatment require an underlying monitoring capacities.
  – Configurable.
  – Reconfigurable during run time.

- Reconfiguration of monitoring capacities (instead of the SOA components)

# Our proposal must be

- **Generic**
  - VOD
  - VoIP
  - DoS
  - Power Consumption
  - etc…

- **Extendible**
  - Adding new monitoring capacities during run time.

- **Able to detect the QoS.**
  - In case of deterioration, identify the root reason.

# Existing Projects and Issues

| Research Projects | Existing Monitoring Frameworks |
|---|---|
| VRESCo | SNMP |
| NETQOS | WMI |
| WSAF | NetFlow |
| LLAMA | Cisco IOS IP SLA |
| WSD-MRMS | WSDM |
| ... | ... |

- **Fixed Monitoring FWK.**
  - Using one monitoring FWK.

- **Predefined Metrics**
  - No way to add new metrics during run time.

- **Predefined Monitoring**
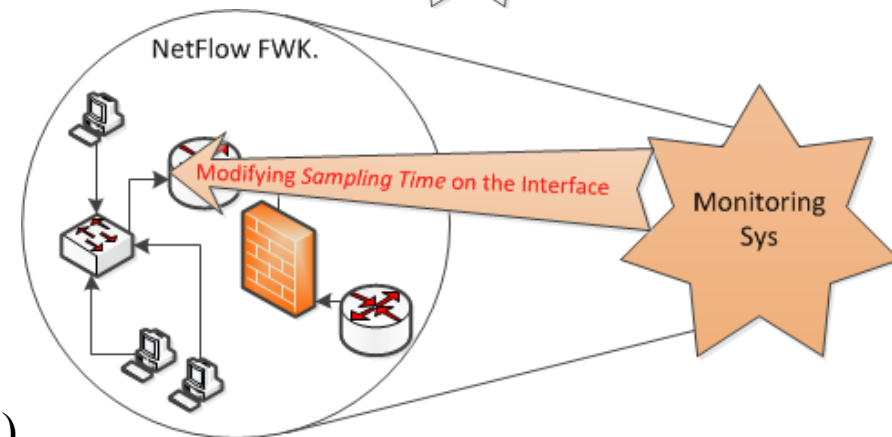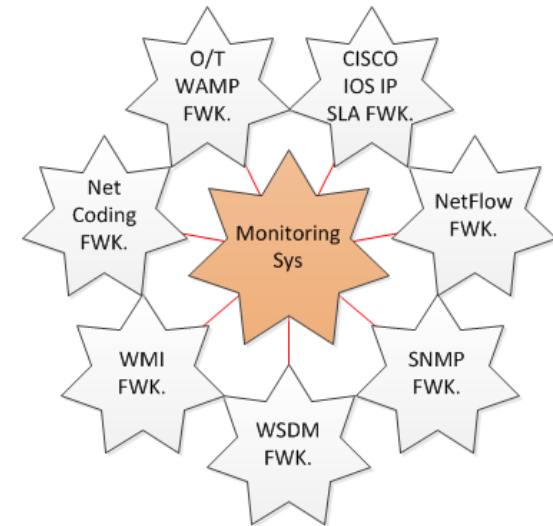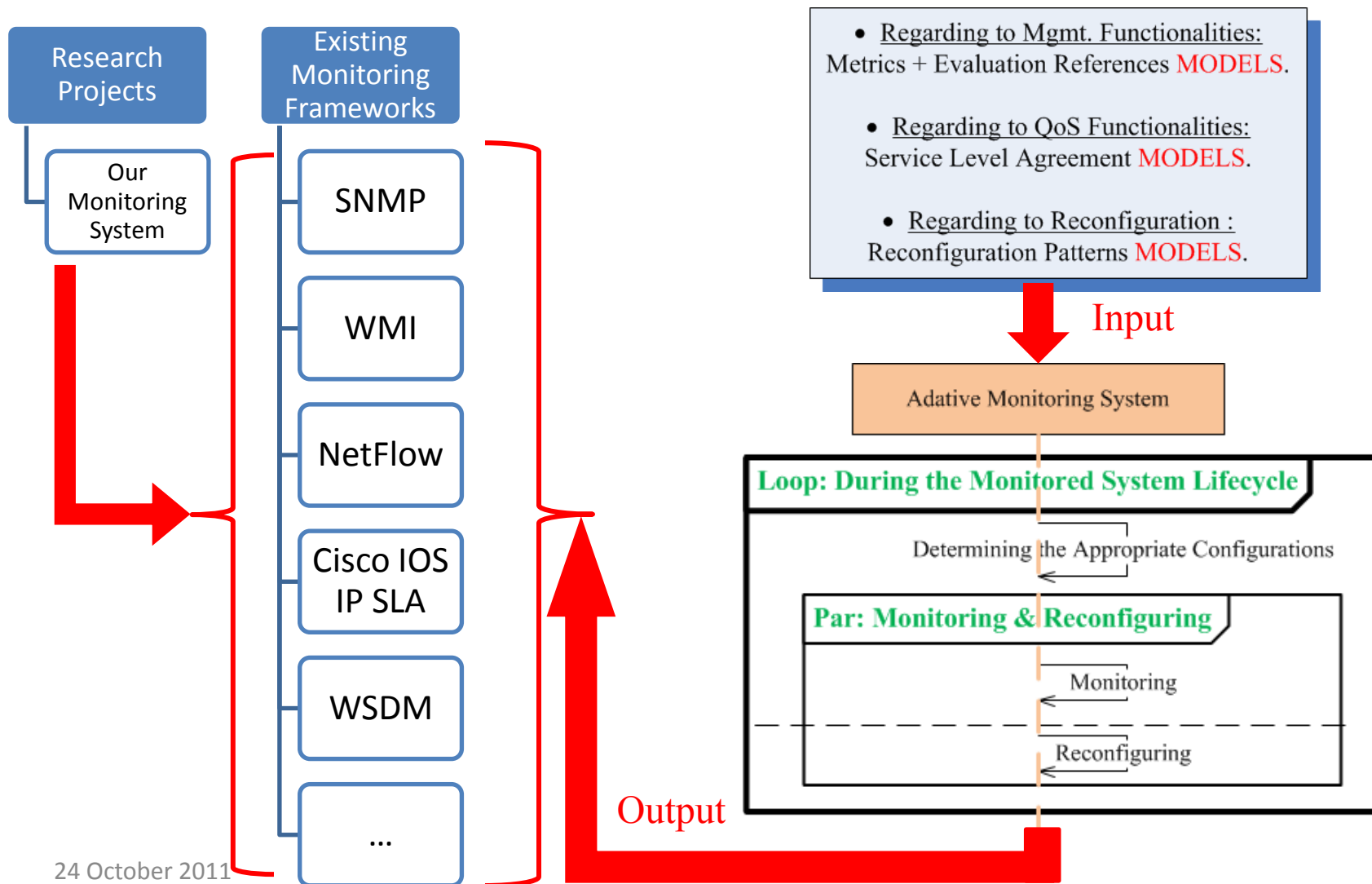  - Modifying the evaluation references (ERs) rather than the monitoring itself.
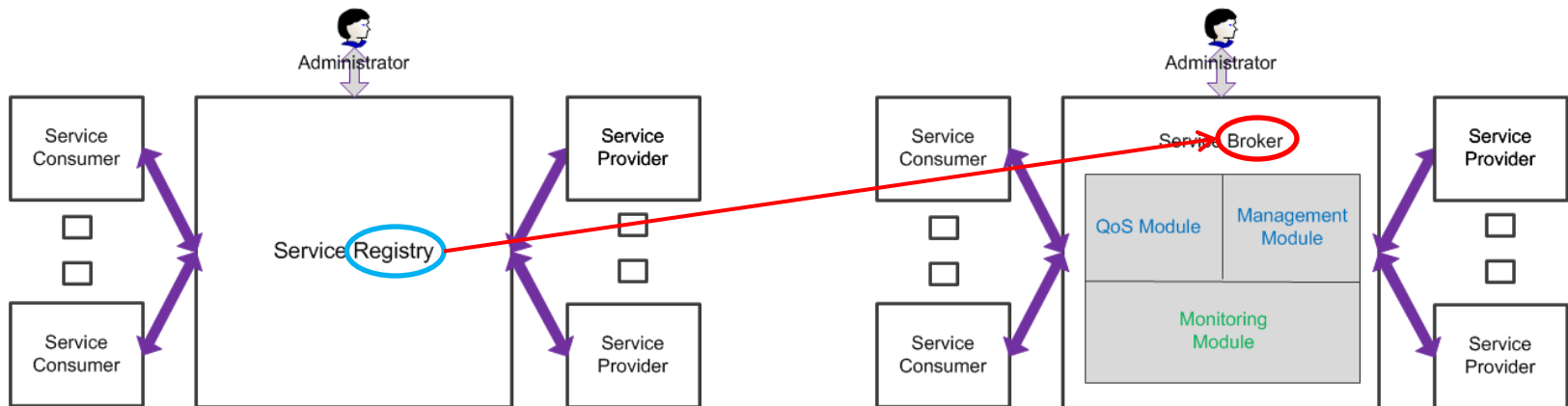
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# Adaptive and Model–Driven Monitoring for Mgmt & QoS Purposes

# Architecture Evolution

- Traditional Functional Architecture:

*Service-Oriented Architecture*

- Enhanced Functional Architecture:

*SOA Supporting Mgmt & QoS*
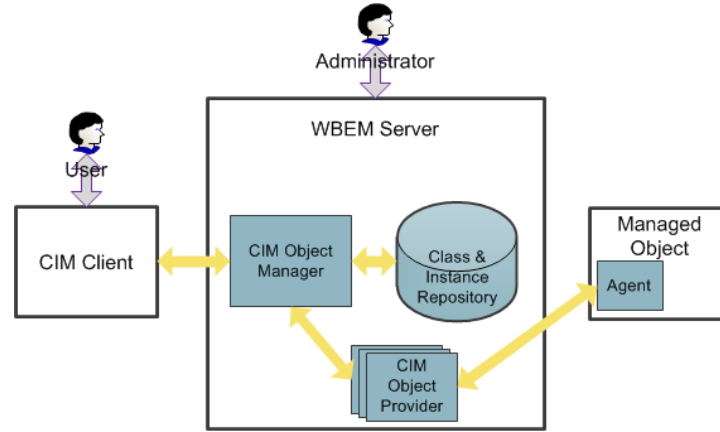
# Architecture Evolution (cont'd)

**Enhanced SOA**

- Implementation independent
- Platform independent
- Dynamic Arch.
- Embedding Mgmt & QoS
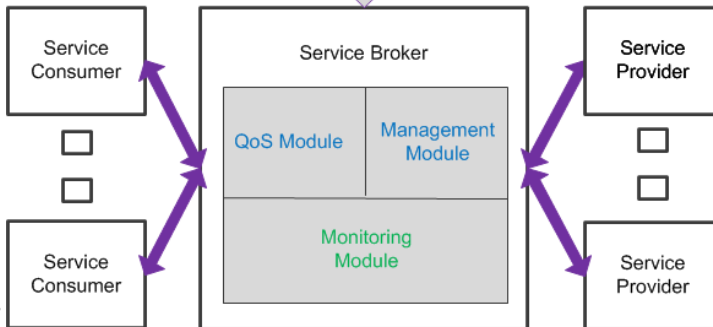
Management Architecture



**WBEM Architecture**

- Management
- Model-Driven
- Interoperability

Enhanced SOA
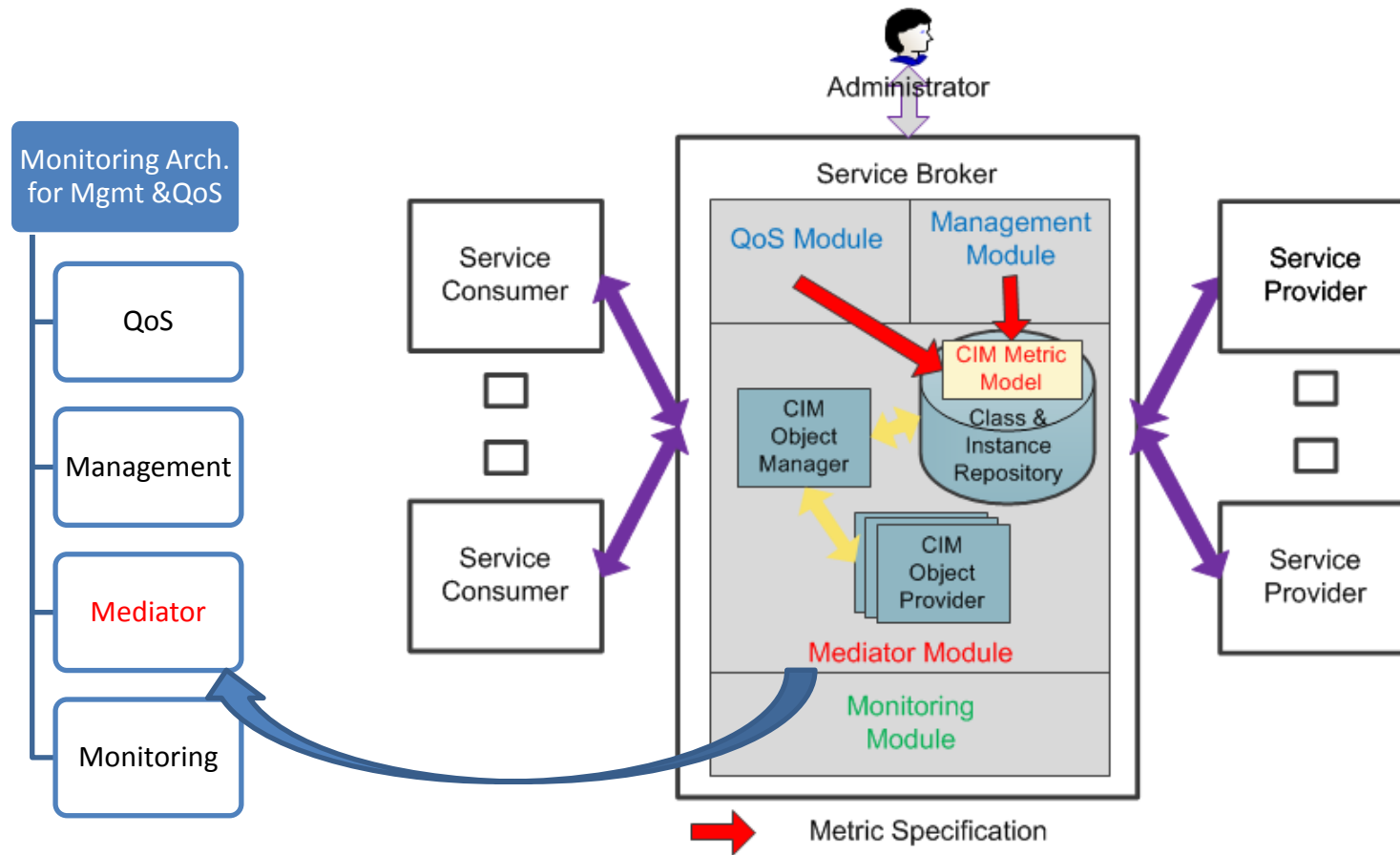
# Architecture Evolution (cont'd)

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- Context
- Our Proposal: a Monitoring Architecture for Management and QoS Purposes
- **Information Model**
    - CIM Metric Model (☺ & ☹).
    - Extending CIM Metric Model.
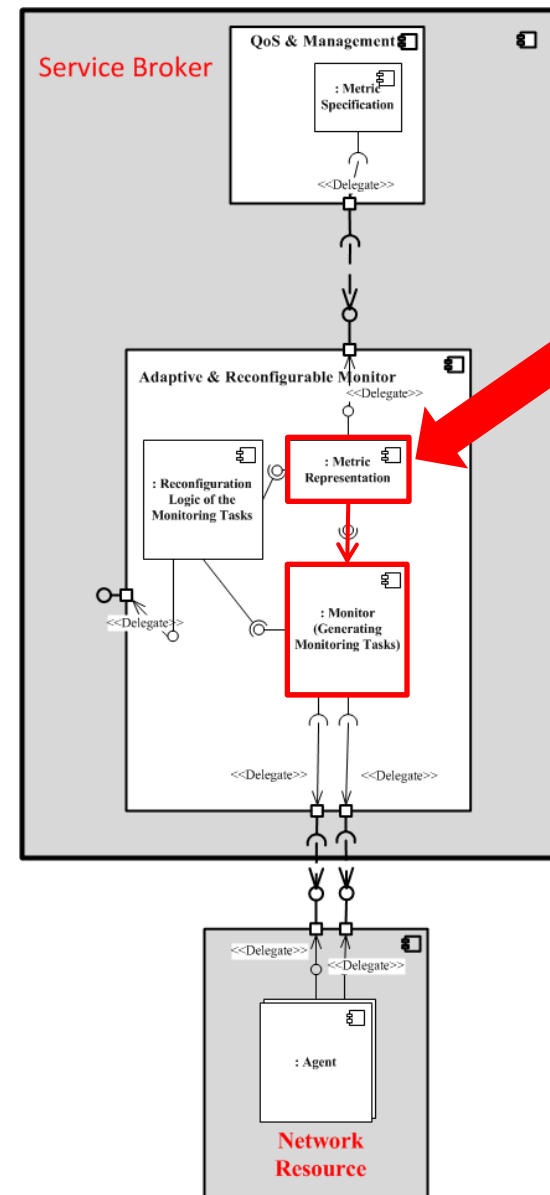- Added Value and Future Works

# Metric Representation Primordiality

Why is the metric representation important?

- From metric specification → monitoring configuration.

- Reconfiguring the monitoring after changes of the monitored environment.

The solution idea …

Embedding some parameters related to monitoring activities into the metric representation.

- Existing CIM Metric Model (V 2.28.0)

**Positive Sides** ☺

- Generic representation.

- The capacity of creating metrics at run time.

- "Bridging Factor"
  - Metric specification → monitoring configuration.
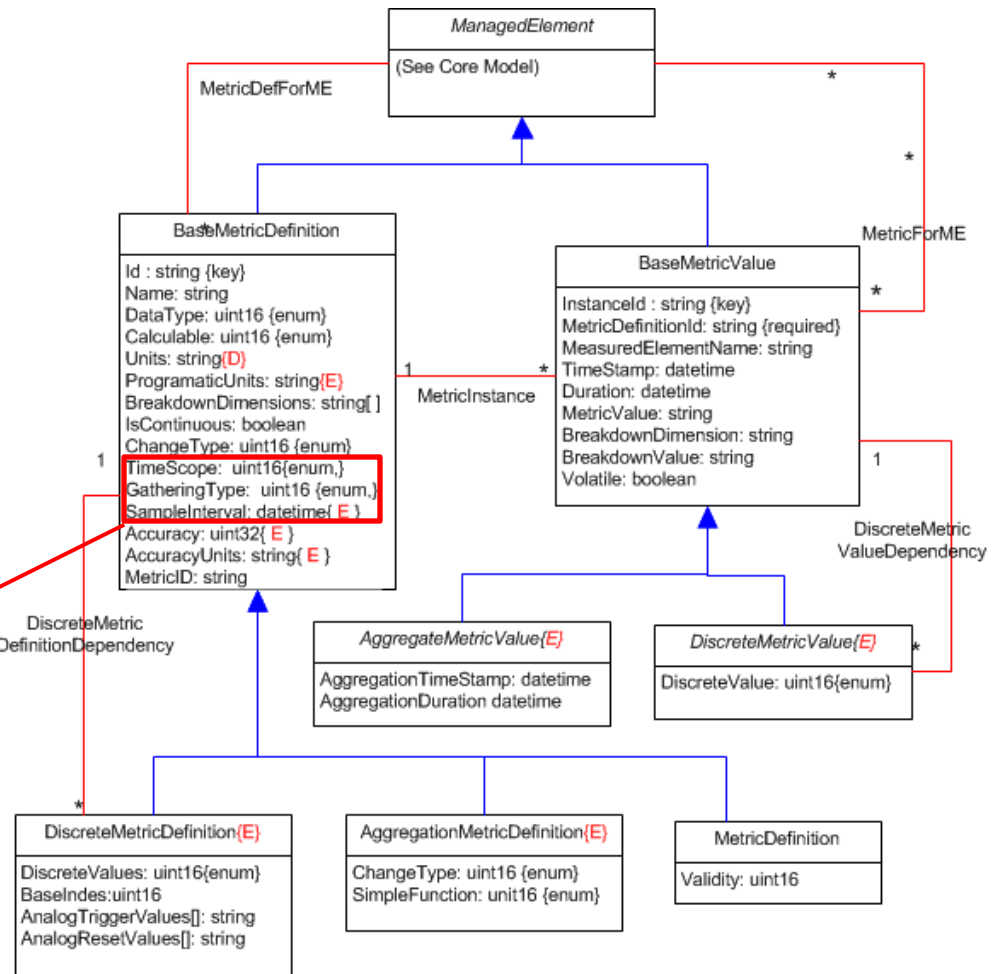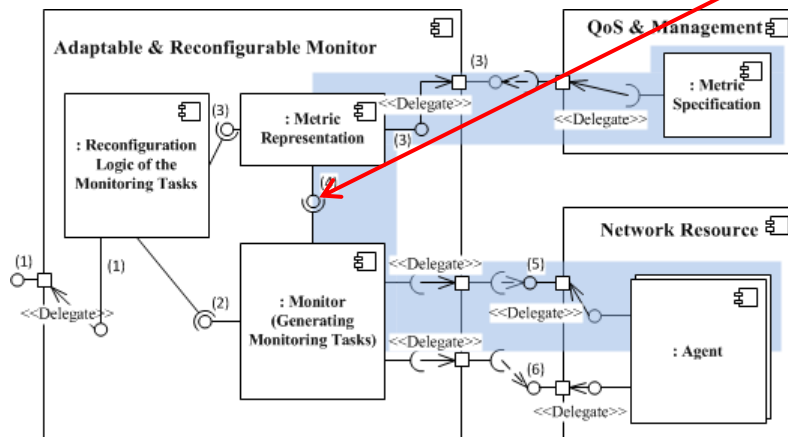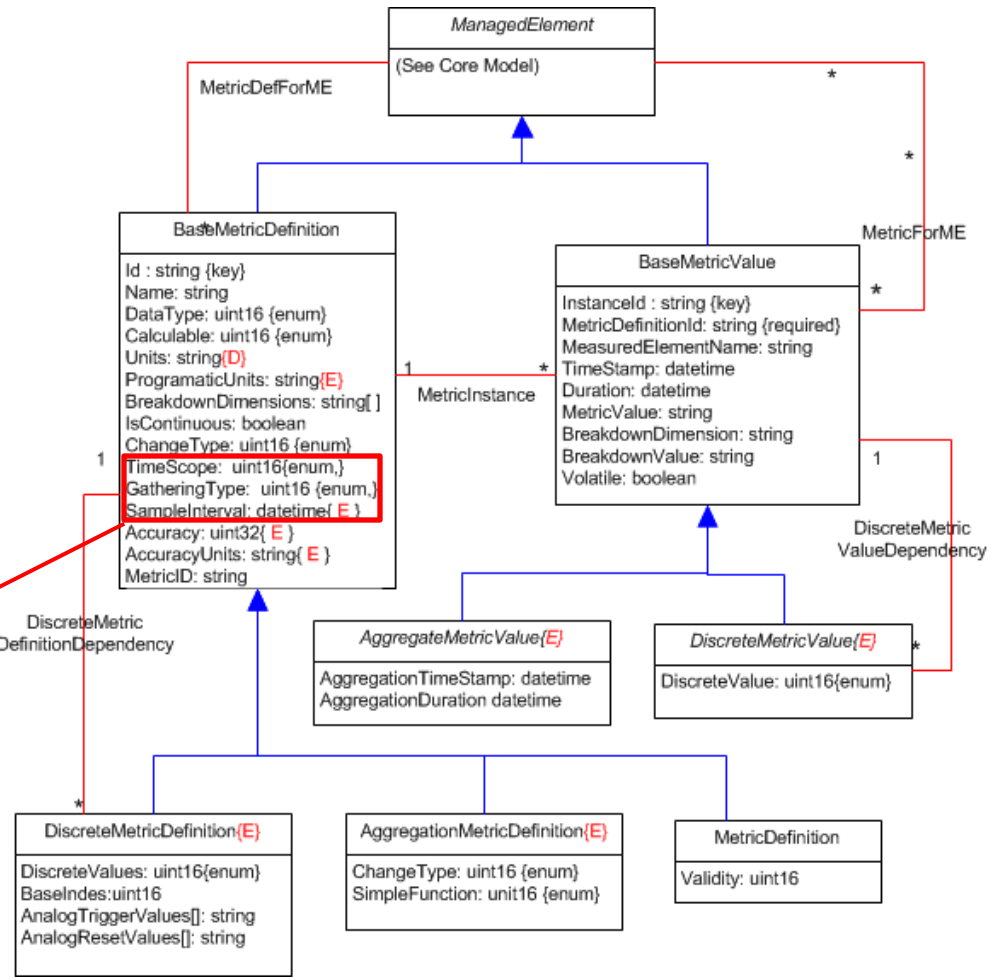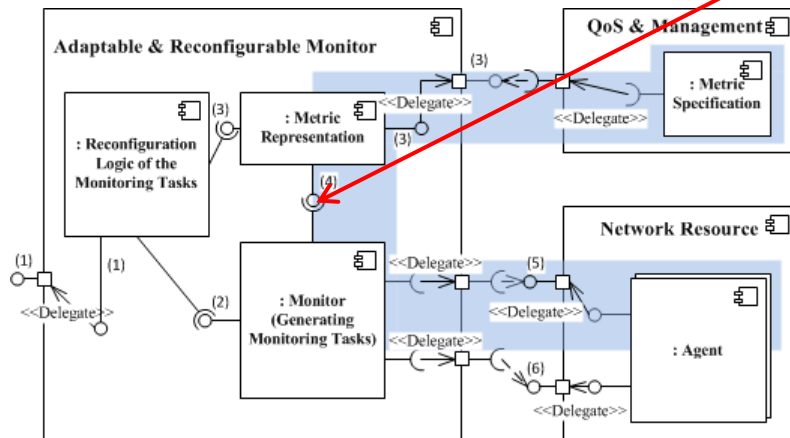
- Existing CIM Metric Model (V 2.28.0)

**Negative Sides** ☹

- It does not support mathematical metrics calculated by formulas.

- "Bridging Elements" are not enough to compose the necessary *Monitoring Tasks*.

NOT ENOUGH ☹

# • Extended CIM Metric

## Mediator Module (Representation)

### •Elementary Metrics

#### •Resource Metrics

Directly polled from the distant resource.

- *tcpActiveOpens (MIB-2).*
- *One-Way Connectivity (IPPM MIB).*

#### •Measurable Metrics

Must be measured / calculated by specific entity (*Service Broker).*
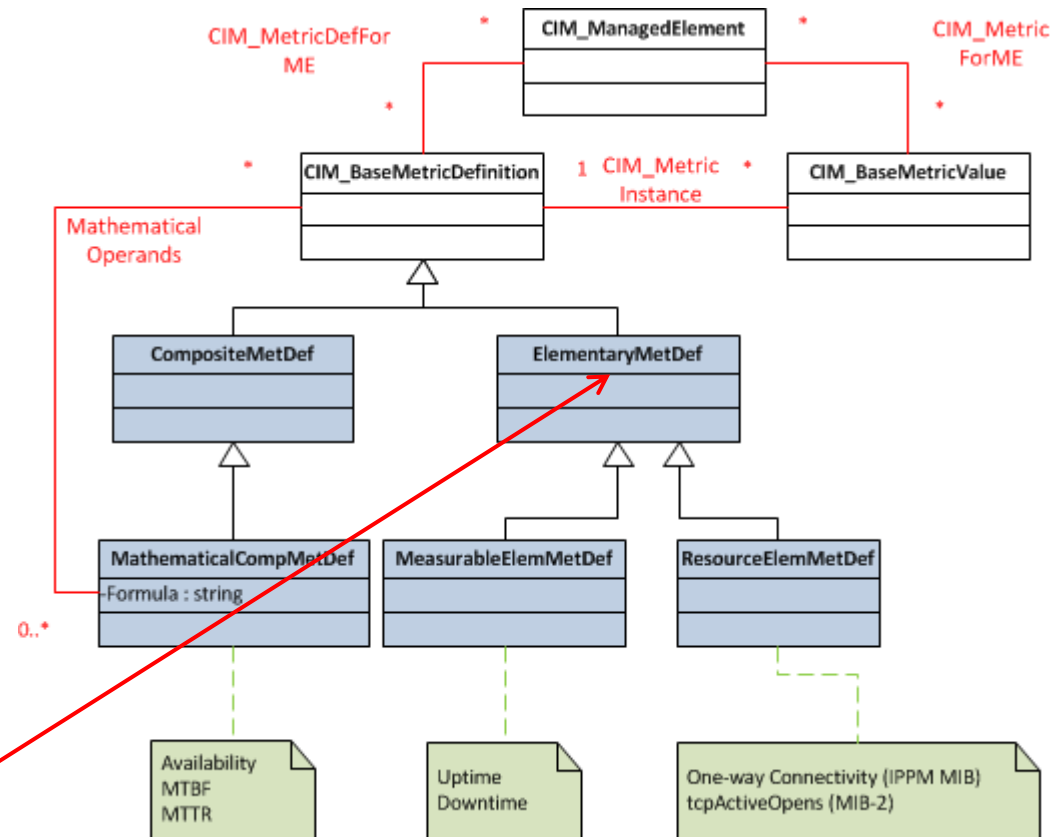
- *Used / Available Bandwidth.*
- *Uptime / Downtime.*

### •Composite Metrics

#### •Mathematical Metrics

it's common to compose new metrics based on the *Elementary* metrics.

- *Availability = Uptime / (Uptime + Downtime)*
- *Jitter=Jitter + (| Delay(i-1,i) | - Jitter) / 16*

# • Extended CIM Metric

**Mediator Module (Instrumentation)**

- **Elementary Metrics**
  - **Resource Metrics**
    - SNMP OP,
    - WMI OP,
    - WSDM OP,
    - etc…
  - **Measurable Metrics**

    Particular OP for each Elementary Metric.
- **Composite Metrics**
  - **Mathematical Metrics**

    Mathematical OP
    - Parses *Formula* string field, and
    - Executes mathematical or statistical operations over the concerned operands.
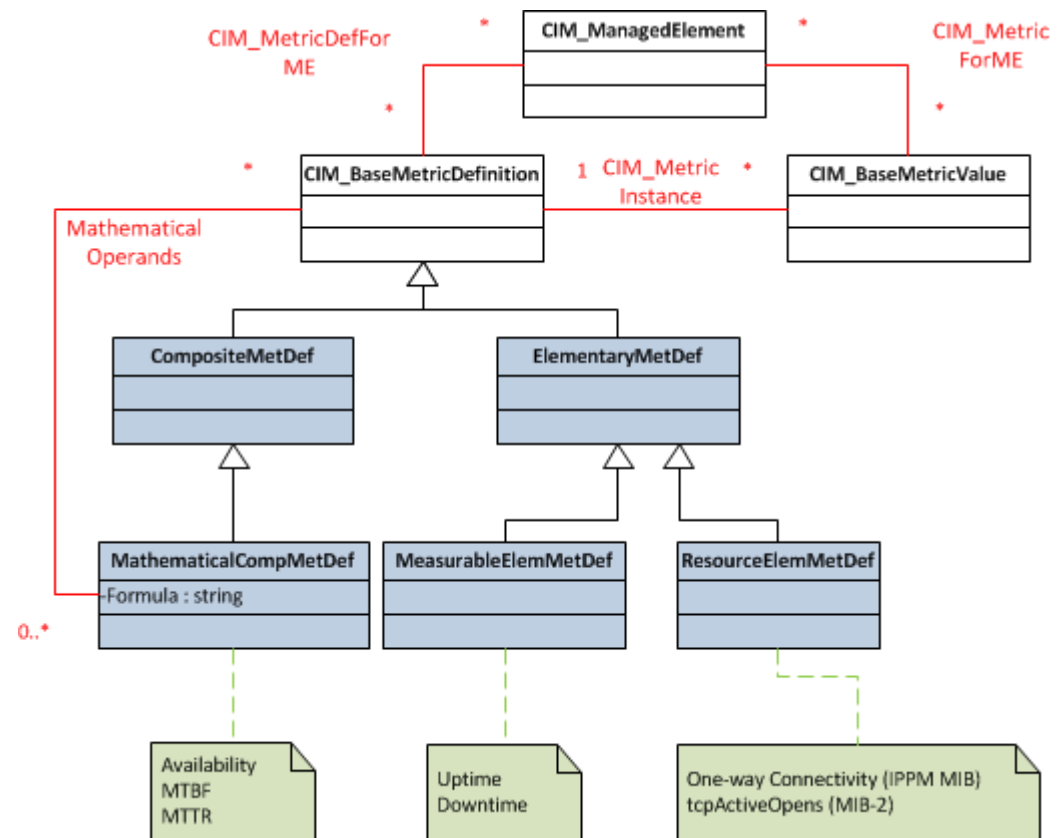
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  - CIM Metric Model (+ & -).
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# The Added Value

- Concerning the Elementary Metrics
  - The flexibility of modeling metrics, either
    - As a *Resource Metrics*
    - Or as *Measurable Metrics*

    Depending on the available information by the remote resource agent.

- Concerning the Composite Metrics
  - Reducing the development
    - "Zero code" for instrumenting *Mathematical Metrics*.

# Future Works

- ## Short term perspectives:
  - – "Best Printer" use case.

- ## Long term perspectives:
  - – Drawing a generic method, that enables:
    - • Guiding administrators, in order to perform some management tasks.
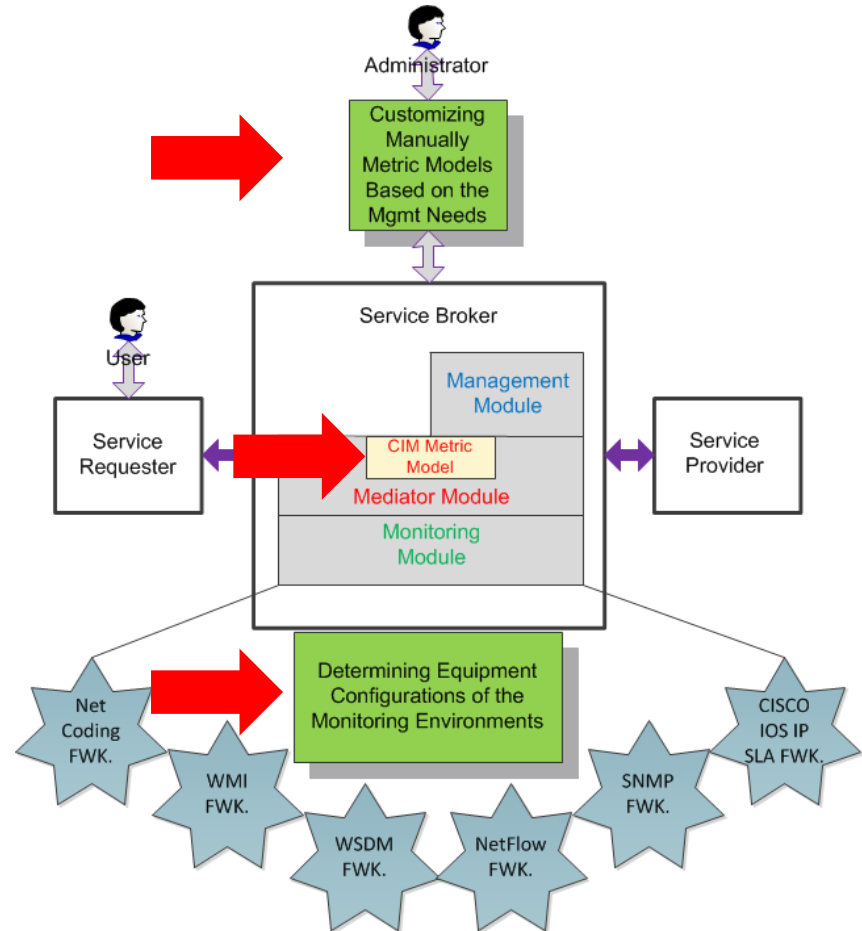
# Future Works

- **Short term perspectives:**
  - "Best Printer" use case.

- **Long term perspectives:**
  - Drawing a generic method, that enables:
    - Guiding administrators, in order to perform some management tasks.
    - Deriving metrics & ERs form SLAs.
  - Adding QoS Semantic of the Metric Model, in order to offer an intelligent analysis of QoS treatment.
  - Determining (re)configuration schemas (integrated in CIM) of metric monitoring. Taking into consideration:
    - "Reconfiguration Objectives" described in reconfiguration patterns.
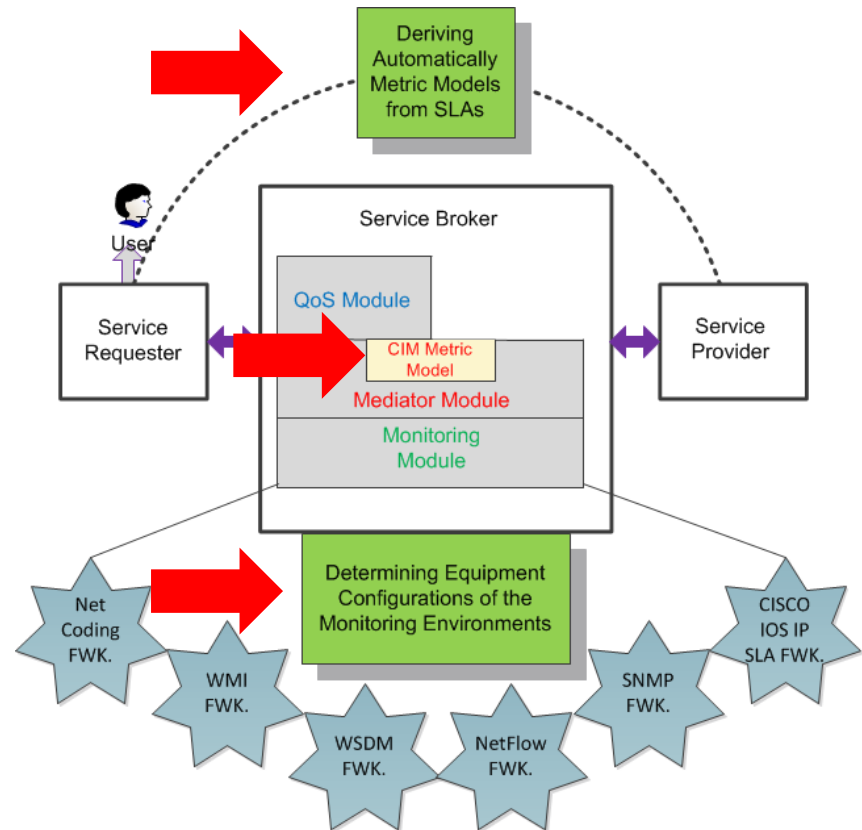
# Thanks for your attention …

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