

ConnI*

Analyzer Connectivity Initiative A Status Report

Ron O'Reilly



Peter van Vuuren



ConnI* CPAC Connectivity Initiative

January 23, 2002

IFPAC 2002

San Diego, CA

CPAC

Overview

- Industry Standard Connectivity:
 - What we mean by This.
 - The benefits of standard connectivity.
- History of the Initiative.
- How we can achieve our goals.
- Where we are at in our quest.
- Where we go next.

What we mean by Connectivity

- Industry Standard Connectivity Spec
- Complete communication specification
- Open system
- Plug and Play
- Communication Spec for 4 domains
 - Measurement Domain
 - Sensor Bus
 - Analyzer Bus
 - Control System or DCS Domain
 - Operations/Maintenance Domain
 - Enterprise Domain

The Benefits of Standardized Connectivity

- Reduce the cost of support.
- Improve data quality.
- Improve reliability.
- Provide an easy entry point for new analyzers.

How Standardized Connectivity Helps

- All **legacy** protocols have deficiencies.
 - 4 to 20 mA loops
 - Modbus
 - Proprietary protocols (Vendor & User)
- Inability to provide data validation.
- Support issues.
- Don't provide remote support sessions.
- Vendor digital systems are proprietary.

- Most analyzer systems have microprocessor technology built in.
- This allows:
 - Digital communication with external systems.
 - Transmission of results and status information.
 - Quality information for validation.
 - Remote support sessions.
- With some exceptions most of this capability is unused.
- We want to change this i.e., take full advantage of computing/diagnostic/communications capability of a microprocessor based analyzer!

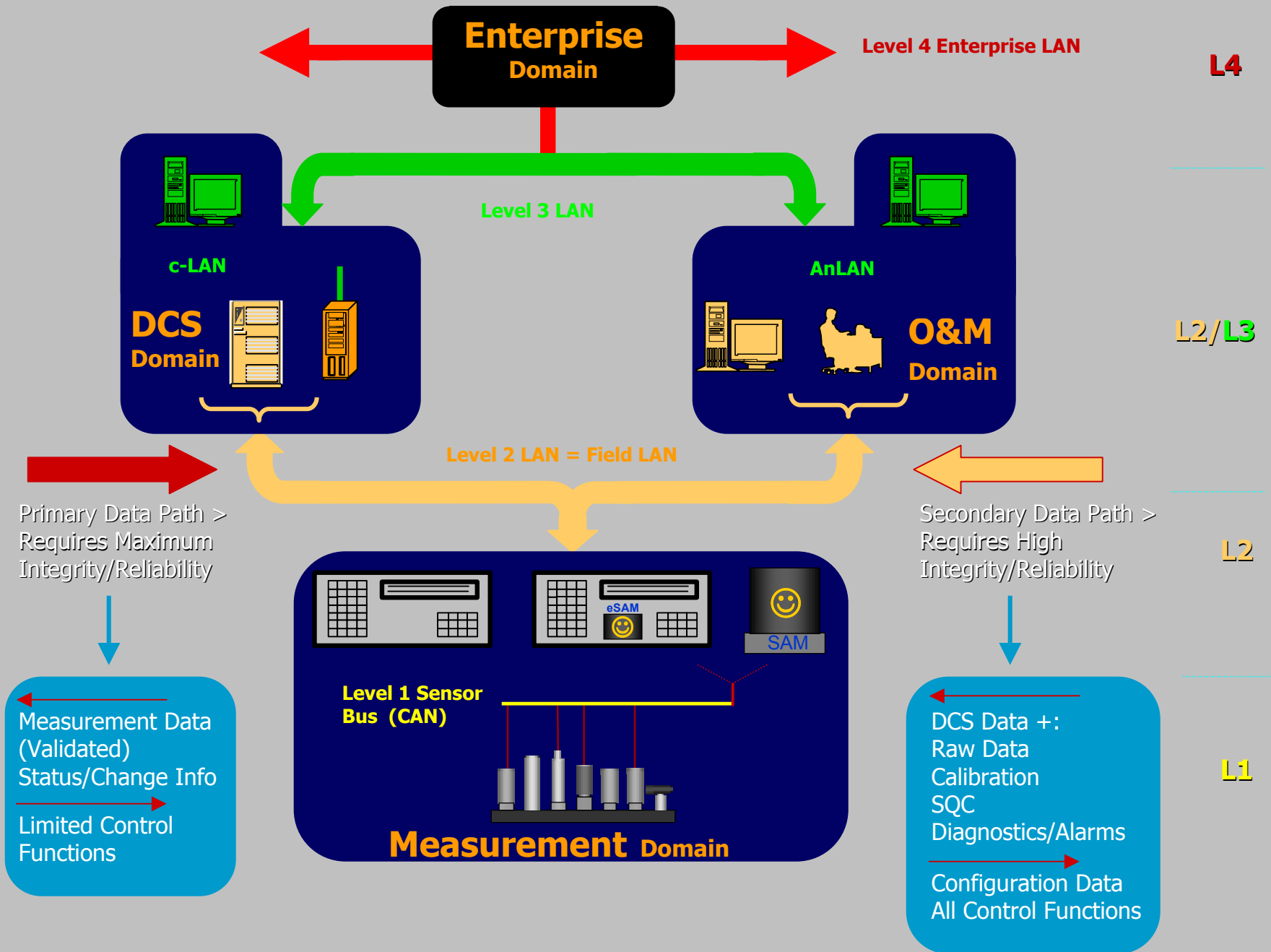
History of ConnI

- Peter van Vuuren presented a paper at IFPAC2001 discussing connectivity options.
- Ad hoc meeting was held at IFPAC 2001.
- Connectivity meeting was held at Pittcon 2001.
- Discussed at the CPAC spring meeting in May 2001.
- CPAC launches the ConnI initiative in June 2001.
- Connectivity specification prepared in summer/fall of 2001.

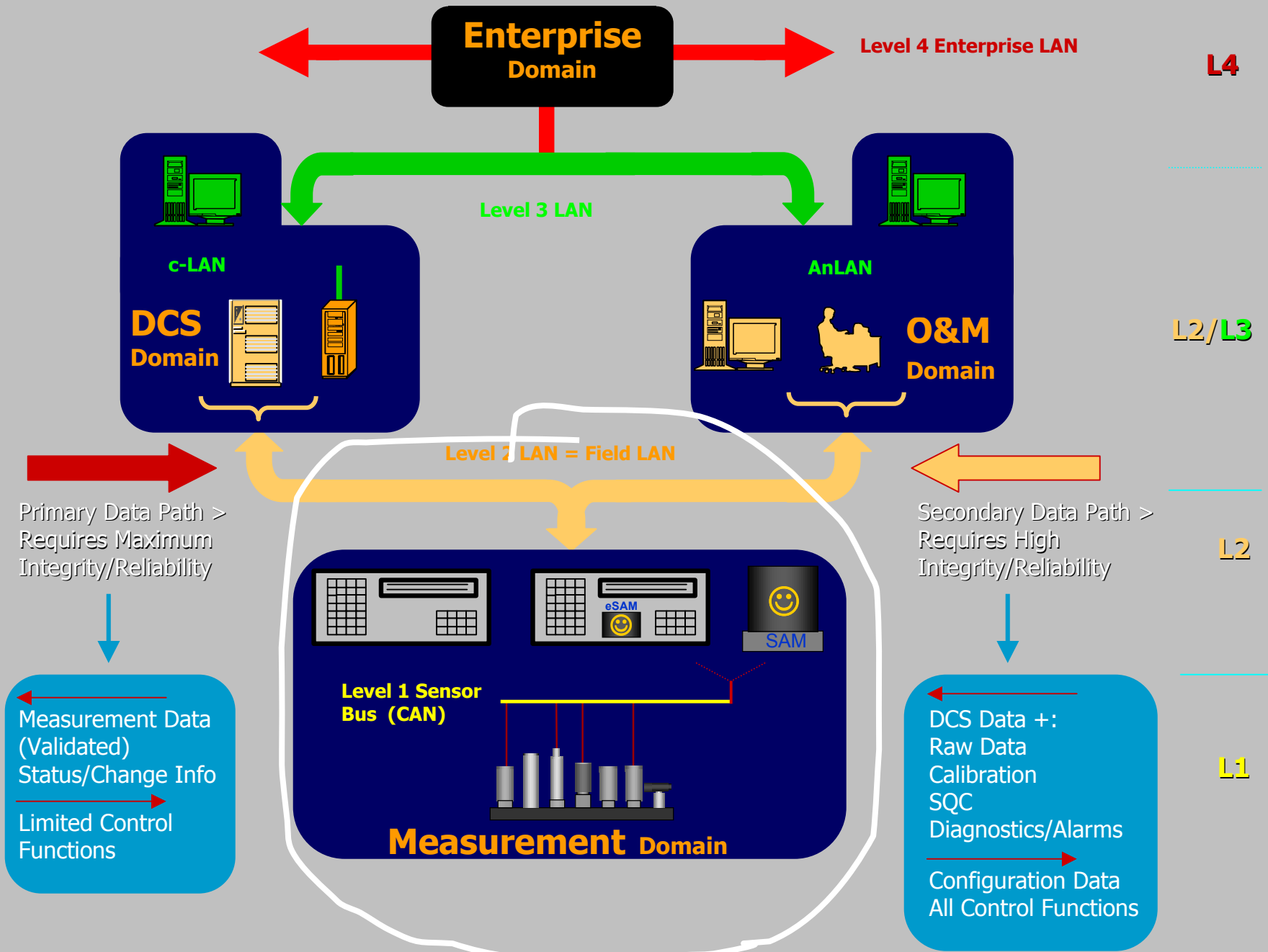
Standardized Connectivity

- Four connectivity domains
 - Measurement Domain
 - Sensor bus
 - Analyzer bus
 - DCS Domain
 - Maintenance/operations domain
 - Enterprise domain

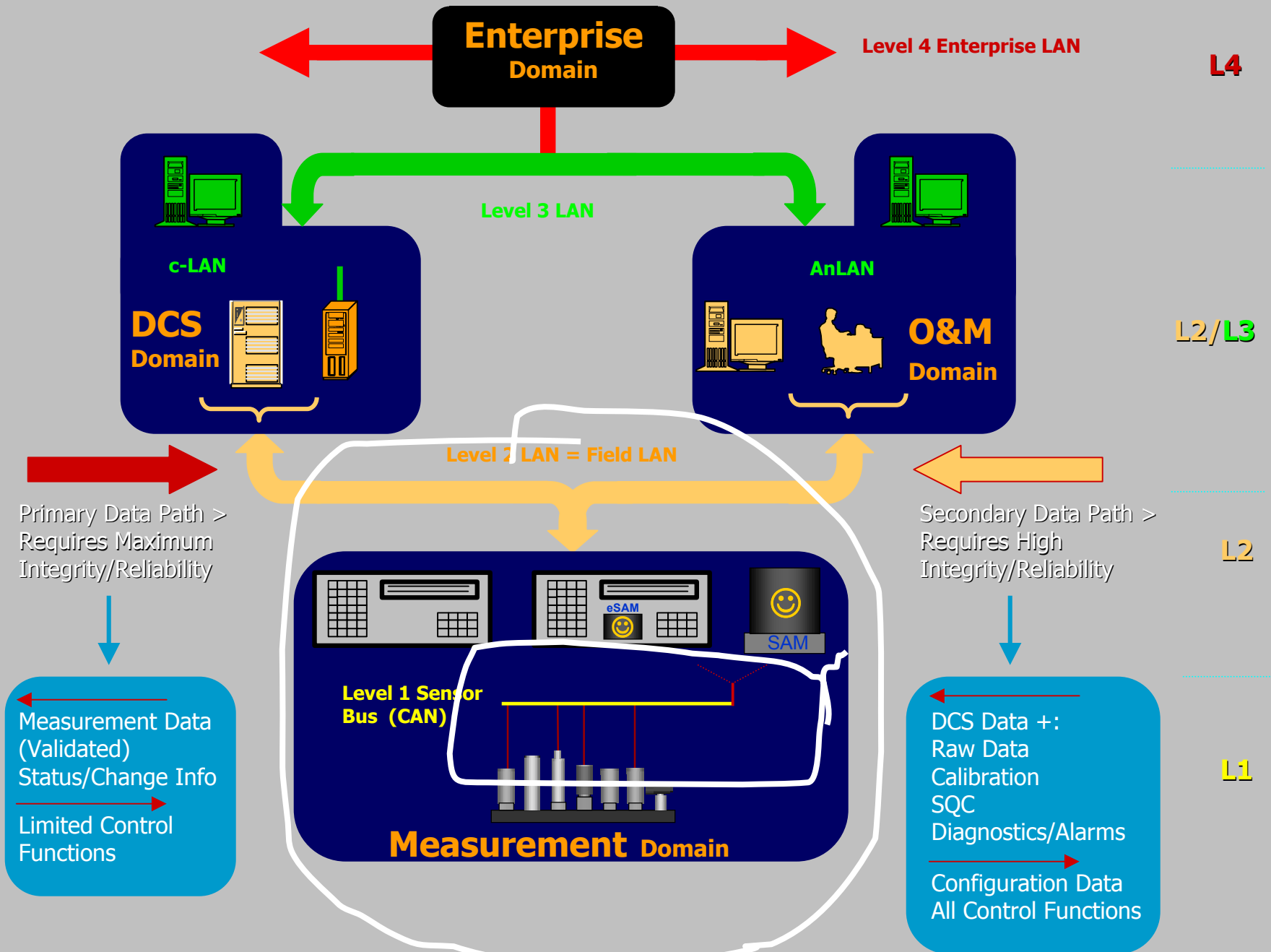
Hierarchical/Domain Model for Process Analyzer System - Overview



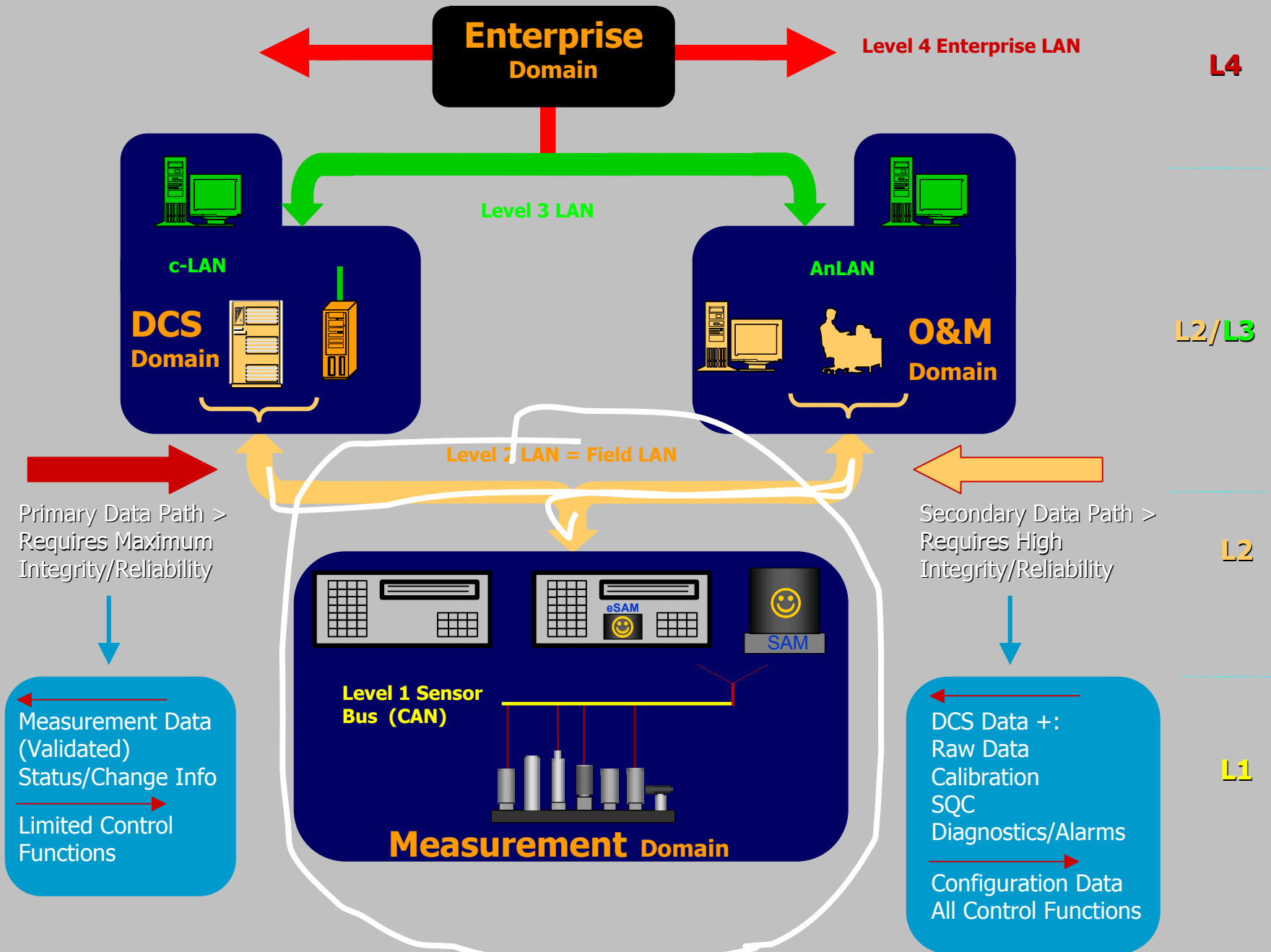
Hierarchical/Domain Model for Process Analyzer System - Overview



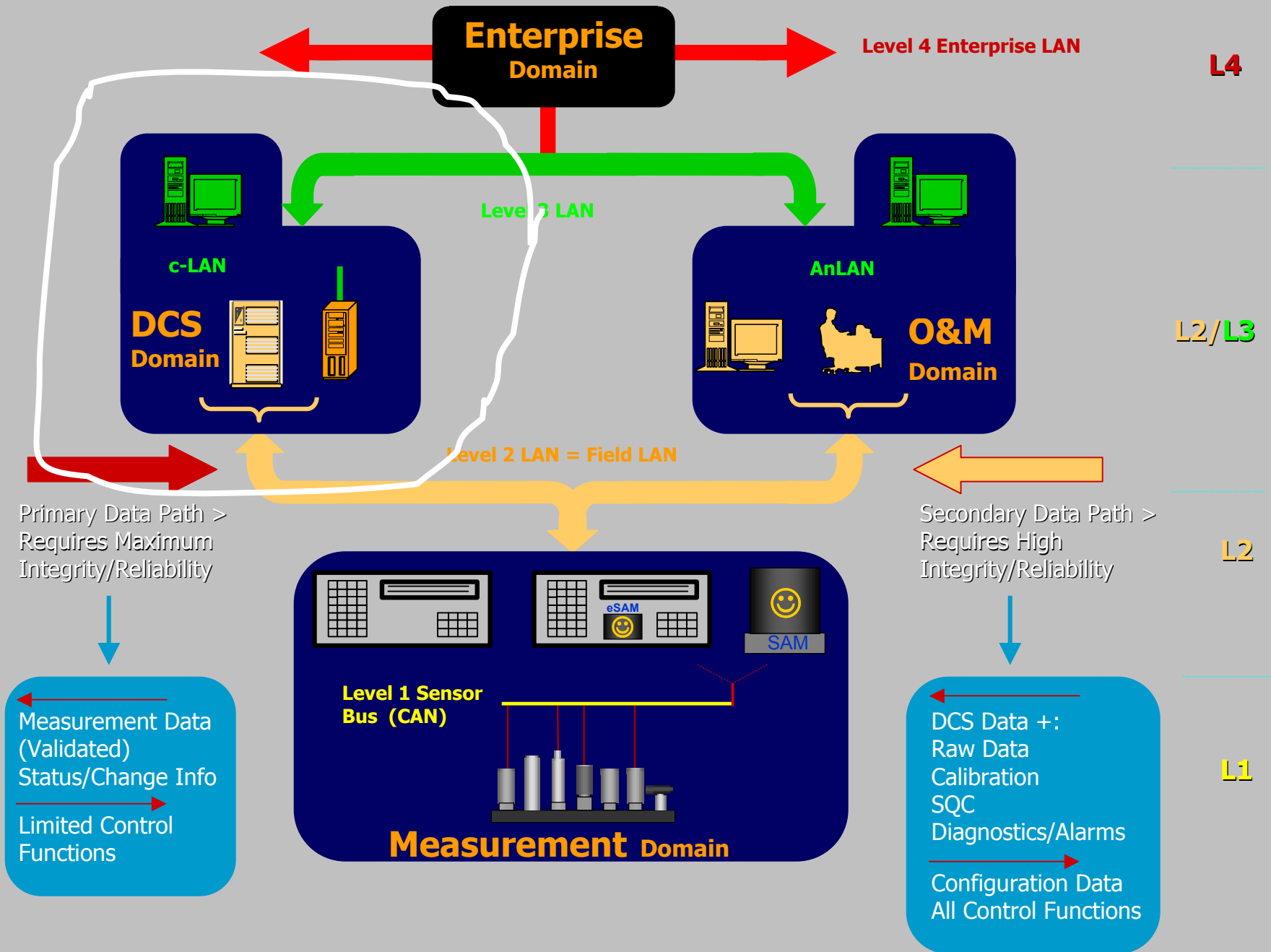
Hierarchical/Domain Model for Process Analyzer System - Overview



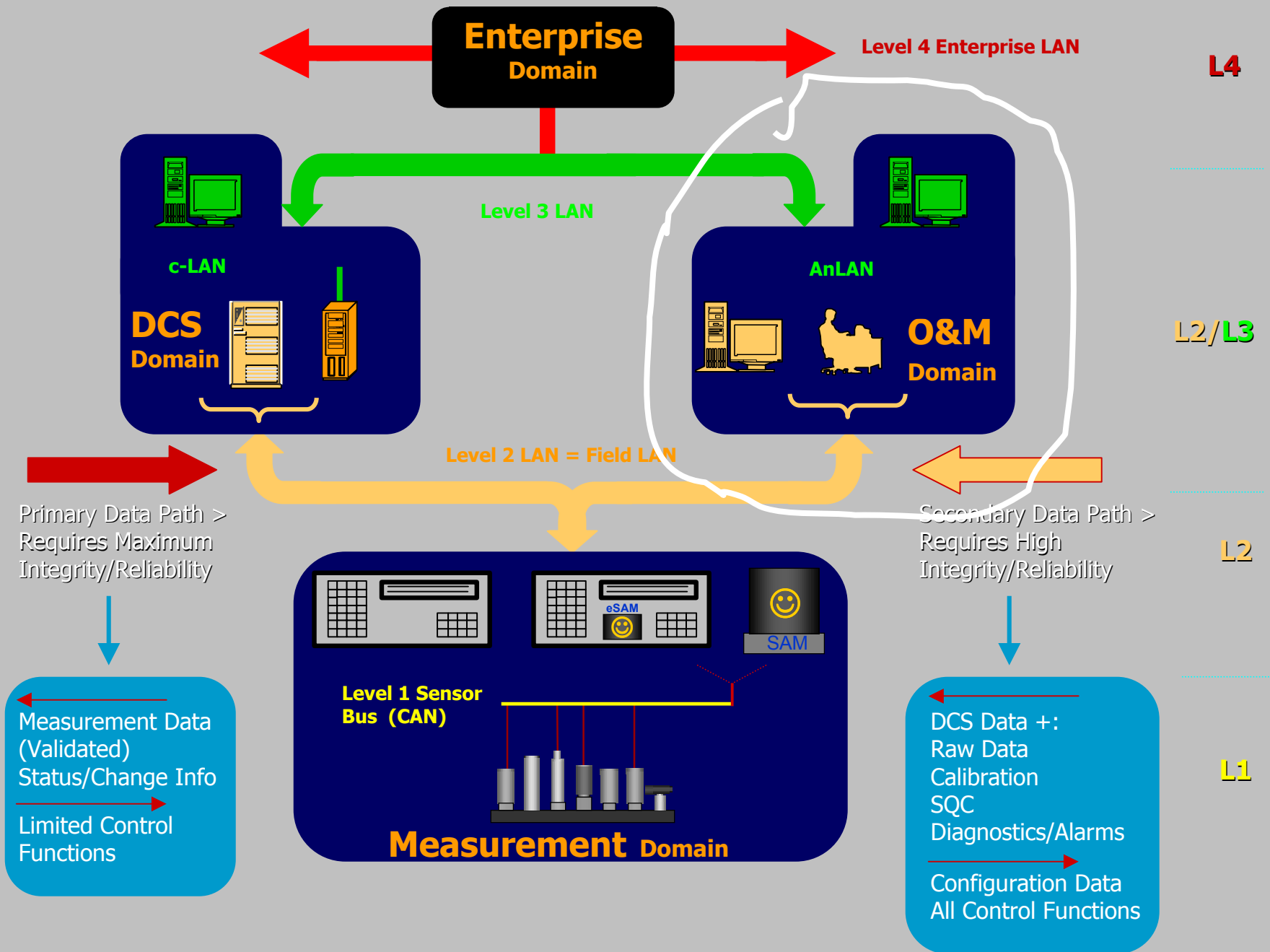
Hierarchical/Domain Model for Process Analyzer System - Overview



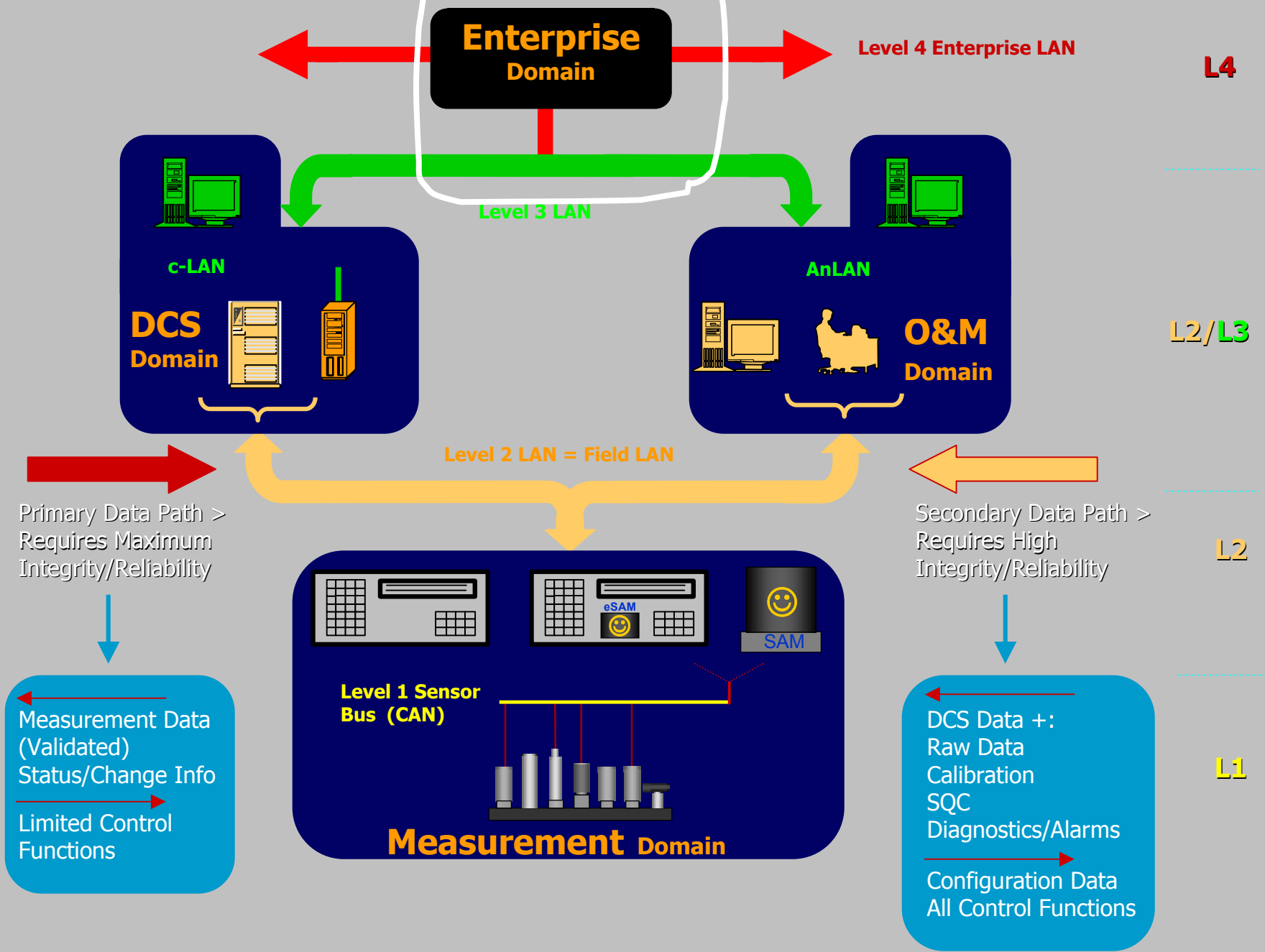
Hierarchical/Domain Model for Process Analyzer System - Overview



Hierarchical/Domain Model for Process Analyzer System - Overview



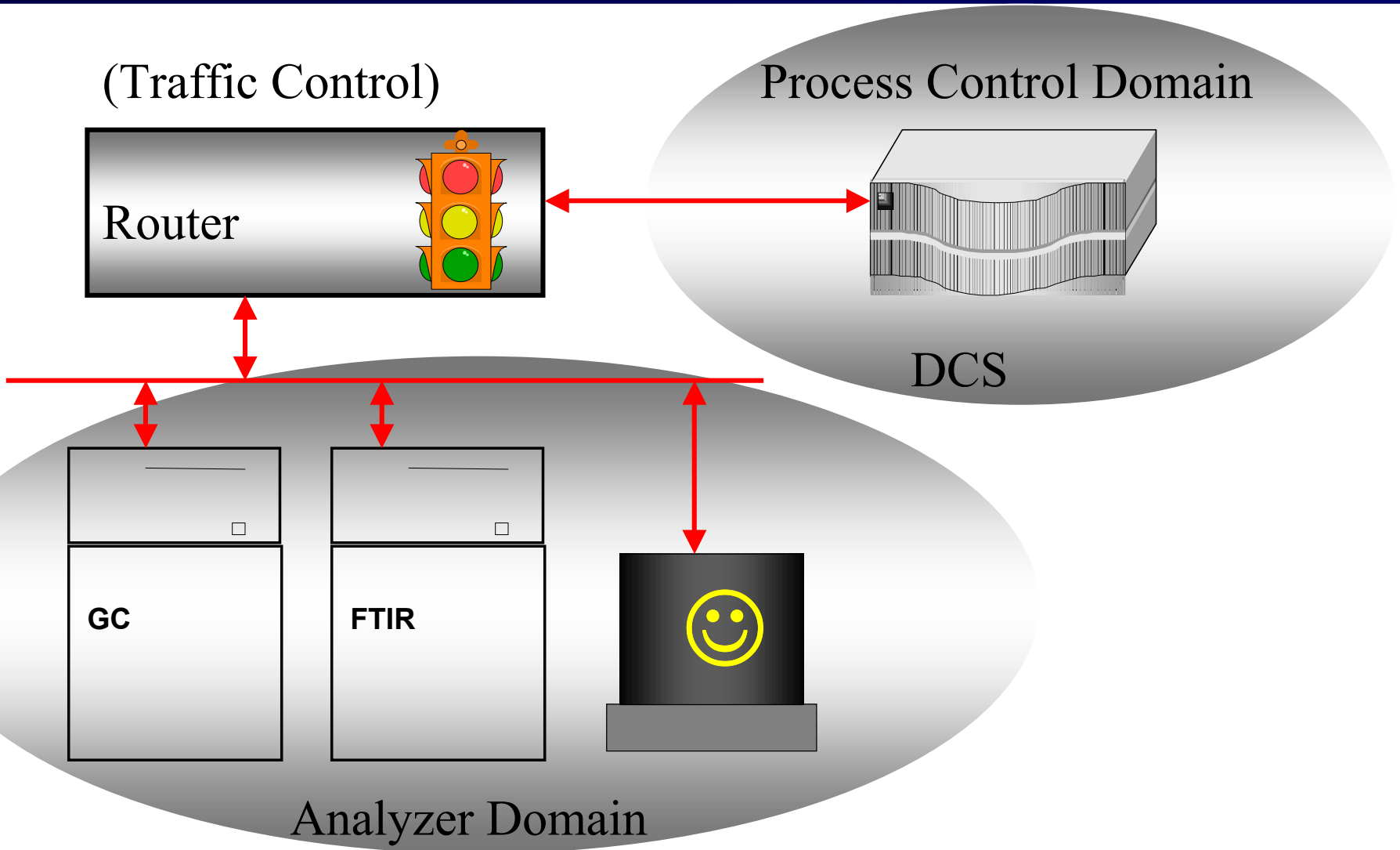
Hierarchical/Domain Model for Process Analyzer System - Overview



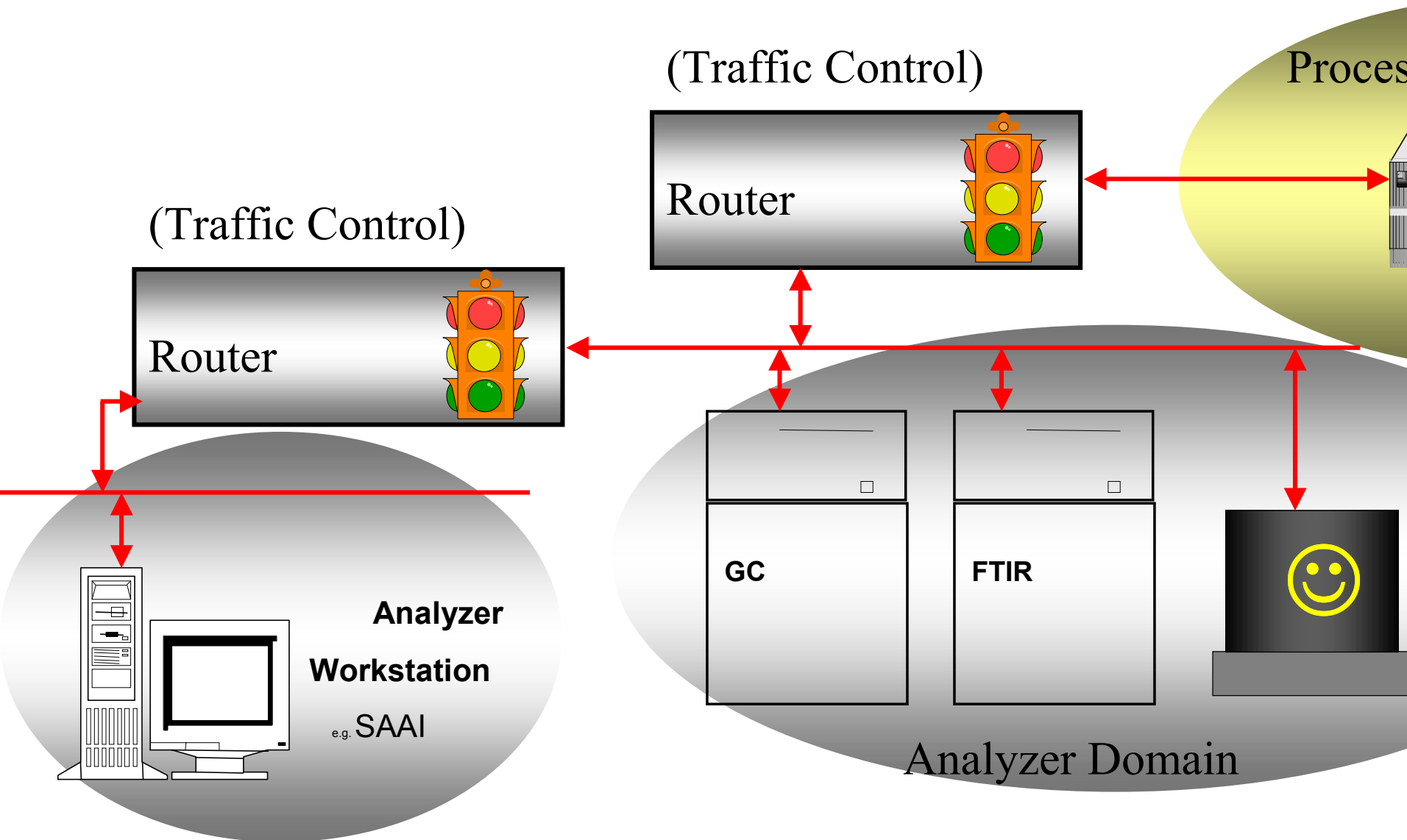
Sensor Bus



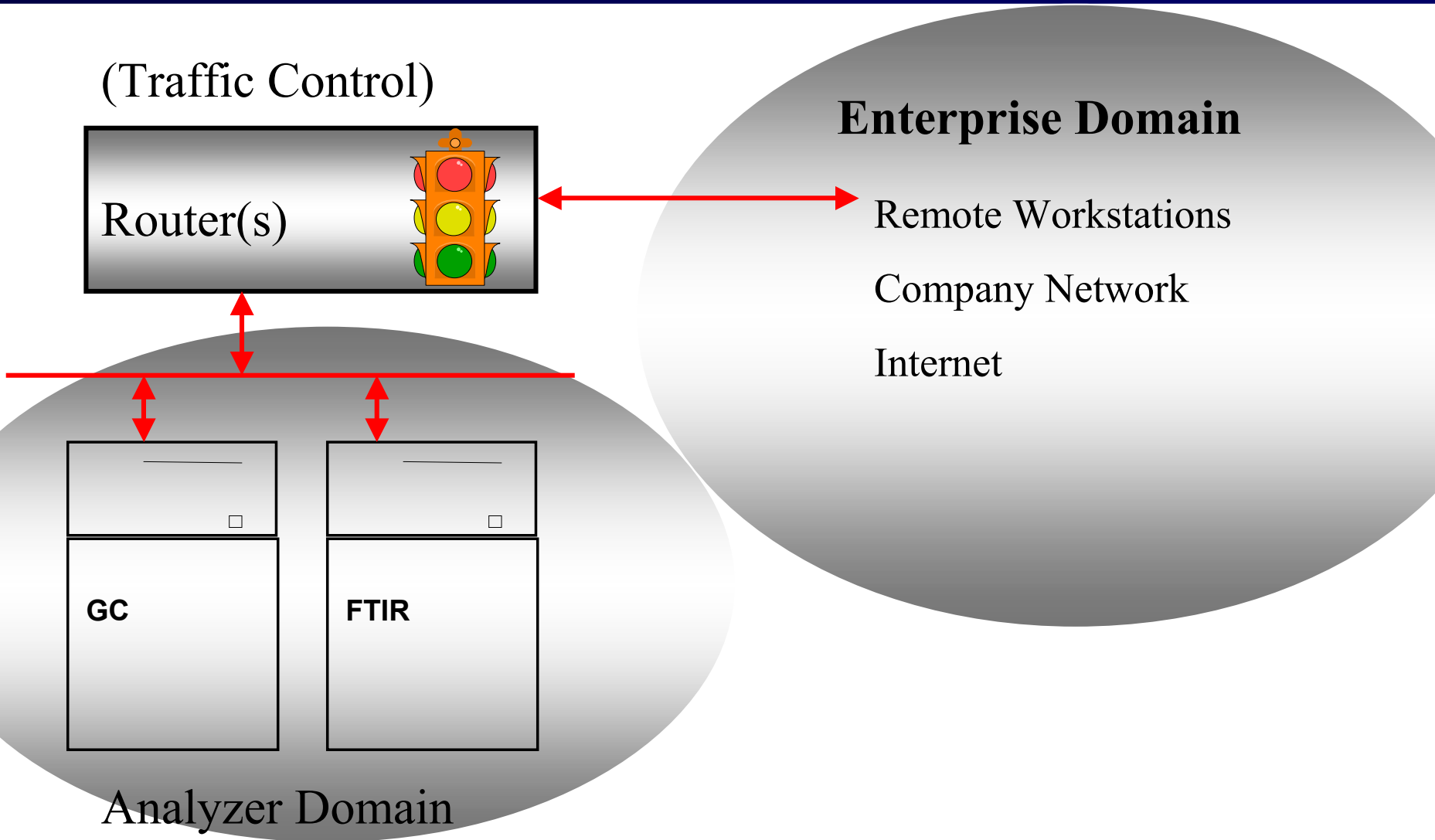
Analyzer Bus



Maintenance-Operations Domain



Enterprise Domain



Connectivity Specification

- We are proposing to use the following as the basis for the connectivity standard.
 - TCP/IP over Ethernet as the backbone.
 - TCP/IP-OPC* for Analyzer-DCS Datalink.
 - CANbus for the Sensor bus.
 - Sensor Analytical Manager (SAM) is essential.

What is OPC?

- OLE for Process Control
- Based on Active X/COM
- OPC provides a common interface for communicating with different process-control devices.
- Backed by the OPC Foundation

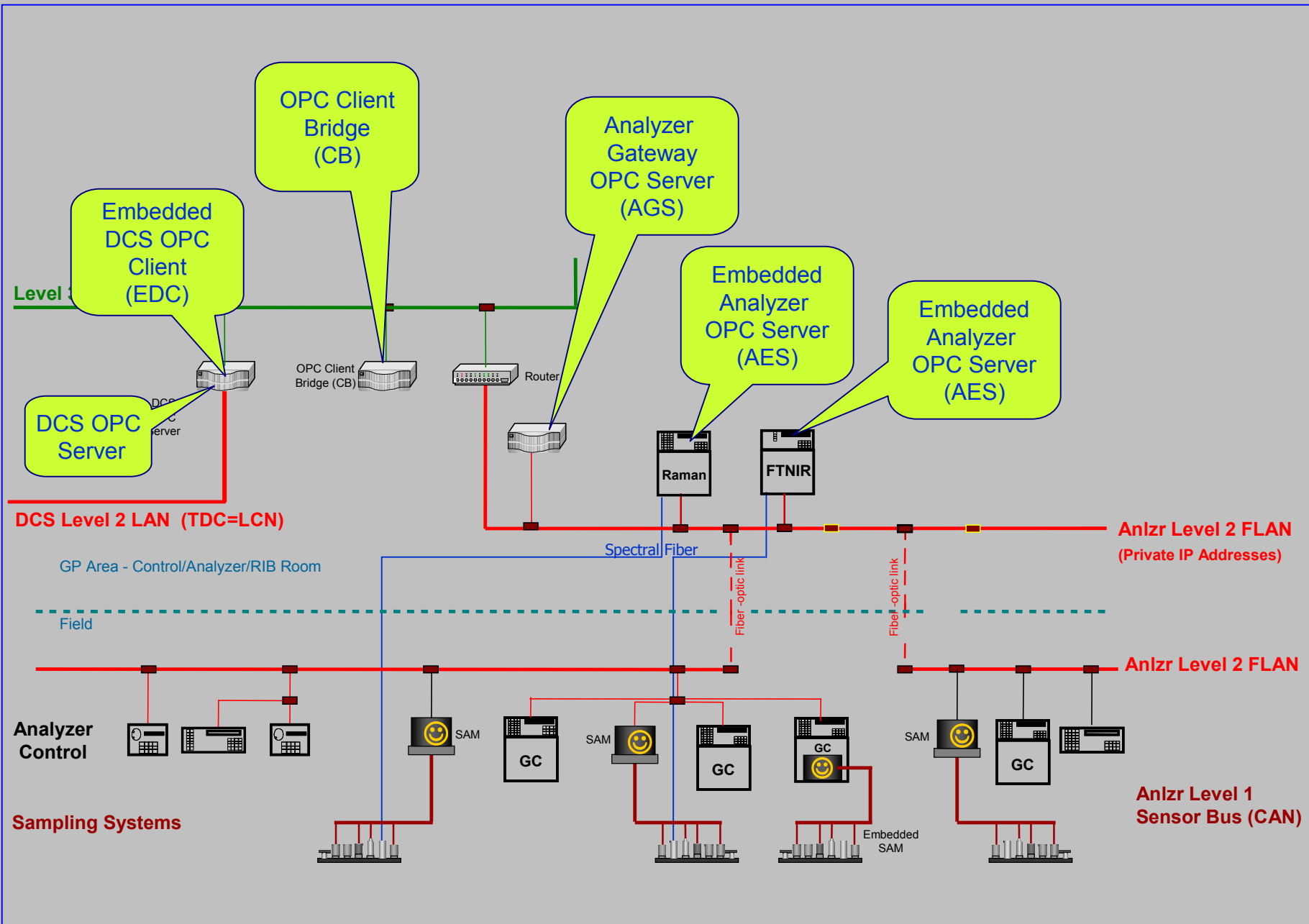
OPC Foundation

- Been in existence since mid 90s.
- Over 200 member companies
- Supported by Microsoft
- Mission is the development of an open interface standard.
- OPC is well developed and is an excellent platform for what we want.

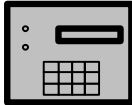

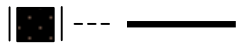

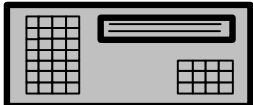



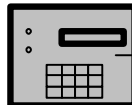

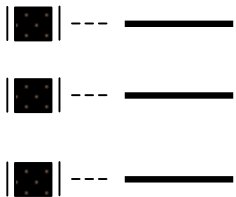

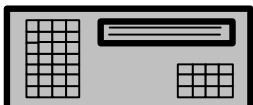

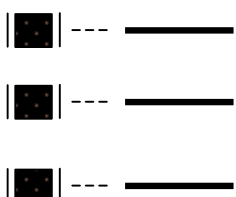
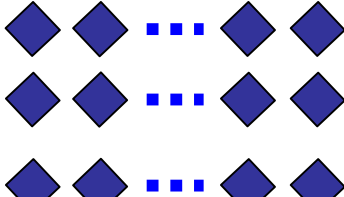
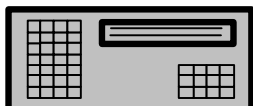


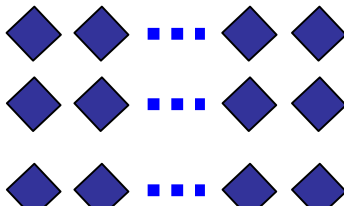
OPC Structure

- Client-Server based system
- Servers exist in the analyzers
- Clients in the DCS and/or Analyzer workstations
- Provides specifications for:
 - Data Access
 - Alarms/Events
 - Historical data access.

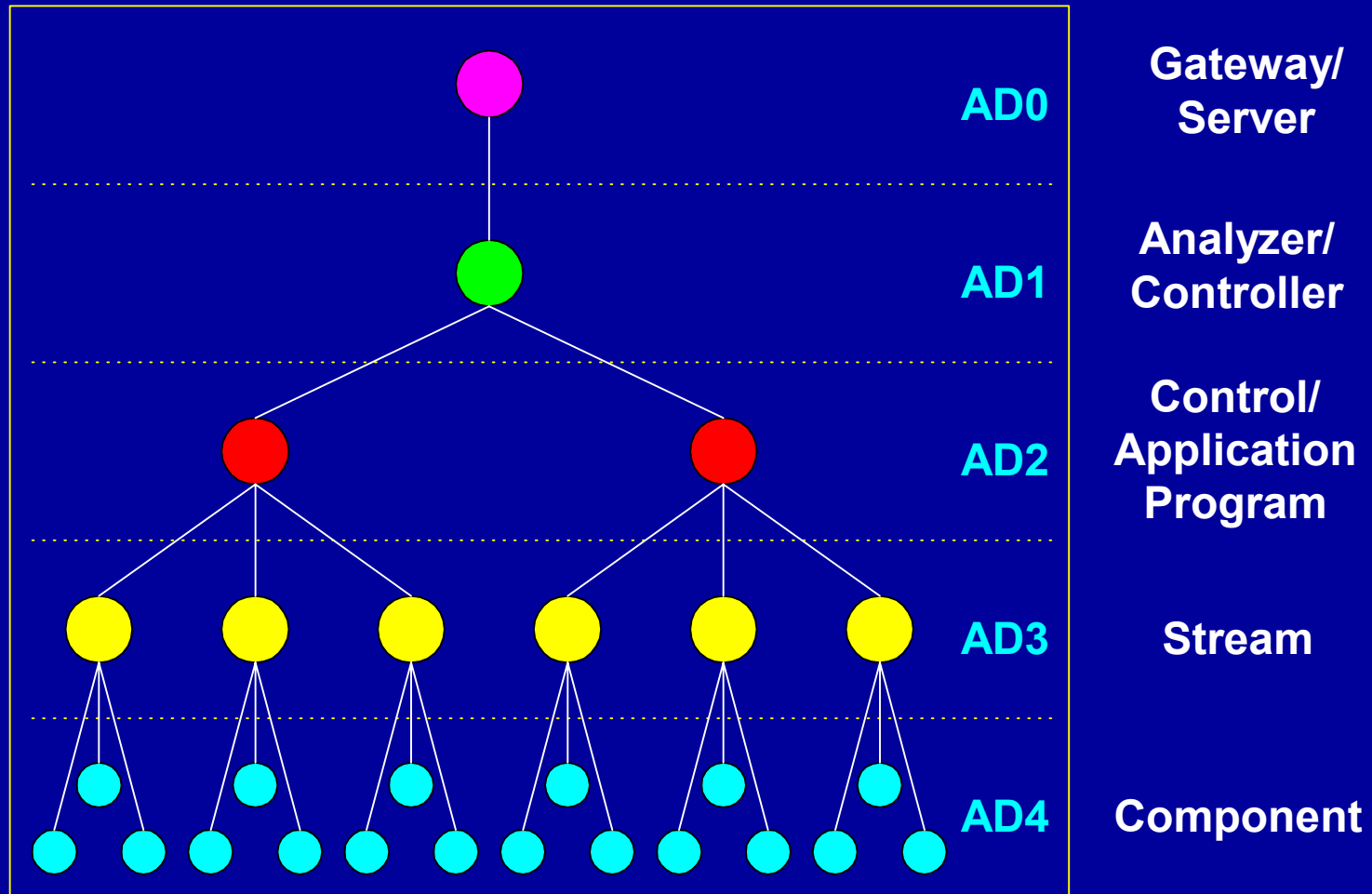
Proposed Connectivity Model - DCS Datalink Client/Server Topologies



Summary of Possible Analyzer Controller and Stream Configurations

Configuration Types	Controller	CAP	Detector/Probe Streams = STRM	Components = COMP	Examples
TYPE 1a Single Controller Single CAP Single Detector/Probe/Stream Single Component					pH Conductivity Oxygen Autotitrator
TYPE 1b Single Controller Single CAP Single Detector/Probe/Stream Multiple Components					Photometer Simple GC
TYPE 2a Single Controller Single CAP Multiple Detectors/Probes/Streams Single Component					Panametrics
TYPE 2b Single Controller Single CAP Multiple Detectors/Probes/Streams Multiple Components					GC Regular GC Master/Slave FTIR RAMAN Mass Spec
TYPE 3 Single Controller Multiple CAP Multiple Detectors/Probes/Streams Single/Multiple Components					GC Master/Master FTIR RAMAN

Proposed OPC Datalink Specification - Address Hierarchy



OPC Datalink Specification - Analyzer Operations as Event Driven Functions

Event	Description
1	Initialization during startup of analyzer server(s)
2	Initialization of DCS database after a DCS restart
3	Completion of a process stream analysis
4	Completion of a validation stream analysis (optional)
5	Completion of a calibration stream analysis (optional)
6	Analyzer State Change
7	Control/Application Program (CAP) State Change
8	Stream State Change
9	Stream Sequence/Frequency Change
10	AGS loses Communications with a remote analyzer
11	AGS/AES lose Communications with CB/EDC
12	CB/EDC lose communications with AGS/AES

Initialization

Data

Status Change

Fault Recovery

Plans:

- ConnI Review/Acceptance of OPC Analyzer/DCS Datalink Specification (1Q2002).
- Testing of Prototype OPC Datalink on a Honeywell System(2Q2002).
- Develop CAN based specification for NeSSI based Sensor/Actuator communications (2Q2002).
- Develop Functional Specification for SAM including Level 1 & 2 Communication Requirements.
- Develop Overall Domain/Connectivity Specification for Measurement/DCS/O&M Domains (3Q2002)