OKI's ATN Router

presentation to

ATN Seminar

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Presentation Objectives

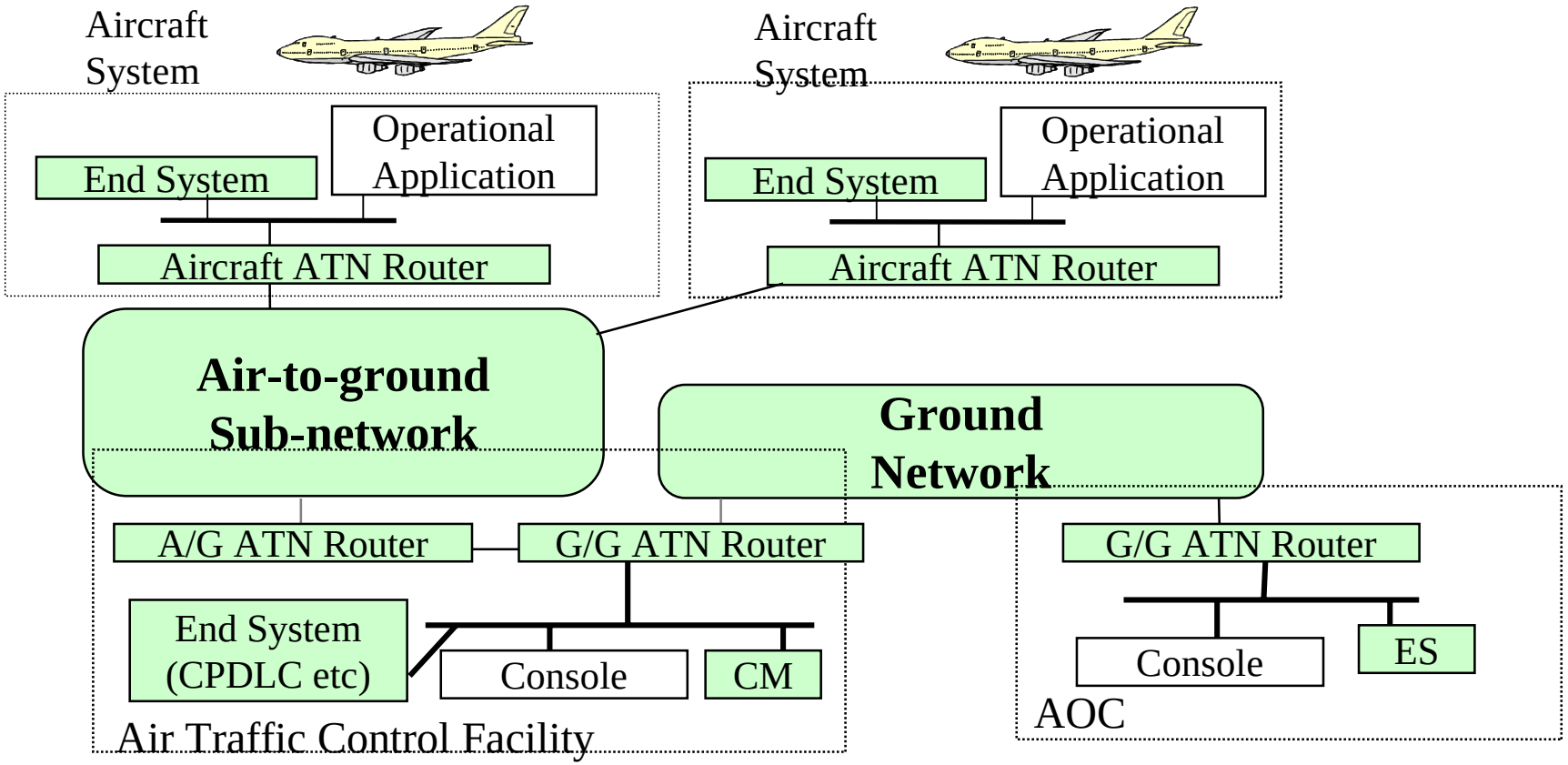
By the end of this Presentation, you should be able to understand:

- The basic principles of an ATN router.
- The characteristics of the Oki ATN router.

ATN Configuration

The ATN is composed of :

- **End Systems** (applications)
- **Intermediate Systems** (routers)
- **Communications networks** (ground, air-ground)



Under ATN, data is transmitted between end systems (CPDLC,ADS, etc.) over a common network (ATN) via ATN Routers.

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What is an ATN Router?

•An ATN Router performs **relaying** and **routing** functions comprising the lowest three layers of the OSI reference model.

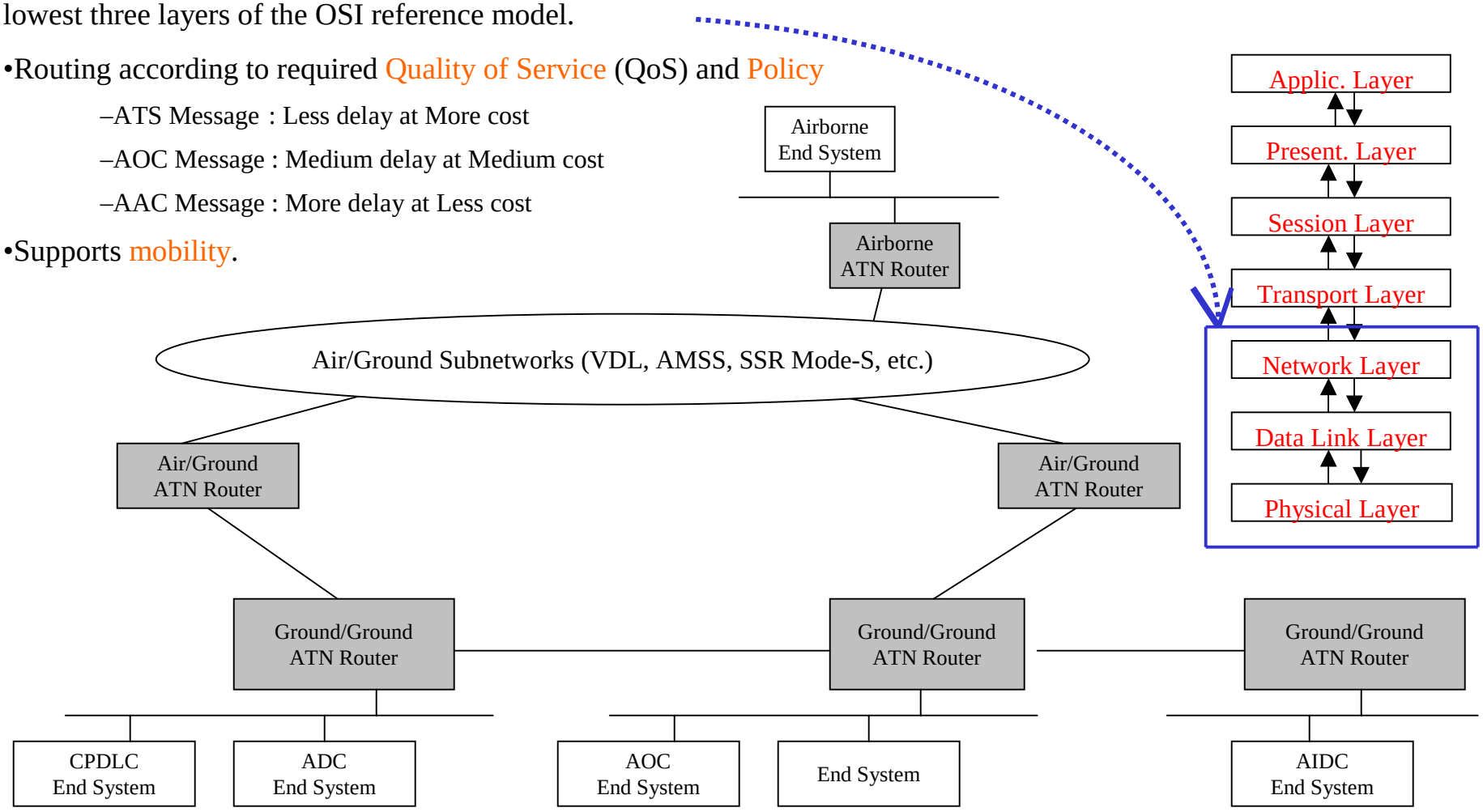
•Routing according to required Quality of Service (QoS) and Policy

–ATS Message : Less delay at More cost

–AOC Message : Medium delay at Medium cost

–AAC Message : More delay at Less cost

•Supports mobility.



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OKI ATN Router Products

		G/G Router				A/G Router	
Type		**NR-0111**	**NR-0110**	**NR-0101**	**NR-0110**	**NR-0211**	**NR-0210**
Package		G/G Router inter-domain comm. package (dual server)	G/G Router inter-domain comm. package	G/G Router intermediate comm. package (dual server)	G/G Router intermediate comm. package	A/G Router comm. package (dual server)	A/G Router comm. package
Protocol		IDRP, IS-IS, ES-IS, CLNP		IS-IS, ES-IS, CLNP		IDRP, IS-IS, ES-IS, CLNP	
Network Management		SNMP version 1.0 MIB2 support					
Line	X.25	6 Lines	8 Lines	6 Lines	8 Lines	8 Lines	8 Lines
		V.11/X.21, V.24/V.28					
	LAN	IEEE 802.3, Ethernet 10Base-T, 100Base-T					

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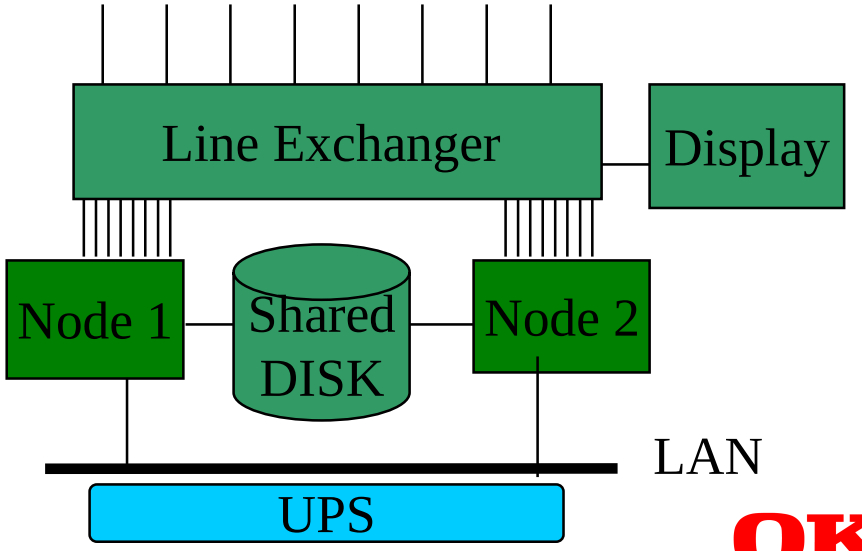
OKI ATN Router: Overview

- **Ground/Ground** and **Air/Ground** ATN Routers
  - Support IDRP, IS-IS and ES-IS routing protocols.
- Compliant with ICAO SARPs
- Highly-appraised user-friendly Graphical User Interface
  - Ease of operation and configuration.
- High availability duplex configuration available
- Remote management function by SNMP agent
- Monitoring function (Node switch) for LAN malfunctions (*e.g.* cable comes out)



ATN Router Functions

OKI router provides the following SARPs-compliant ATN router capabilities:

- **Routing Information Exchange** functions (IDRP, IS-IS, ES-IS)
- **Data Relay** function (CLNP)
- **Subnetwork control** functions (X.25, LAN)
- **Mobile SNDCF** *(minimum functions supported; remainder under development)*

SARPs-compliant Functionality (1)

Routing Information Exchange Function

The OKI ATN Router has functions for exchange routing information with adjacent systems using IDRP, IS-IS, and ES-IS

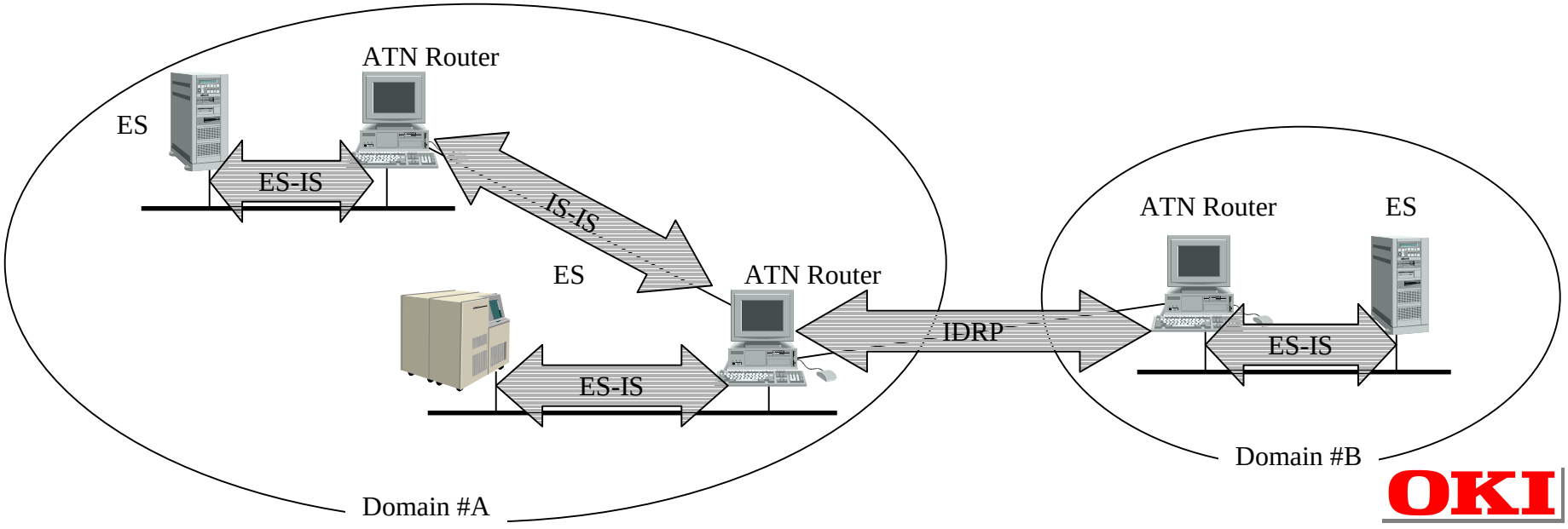
IDRP: between routers connected across domains

IS-IS: between routers connected inside a domain

ES-IS: between router and End Systems

- OKI ATN router can function as Level1 IS, Level2 IS, and BIS.

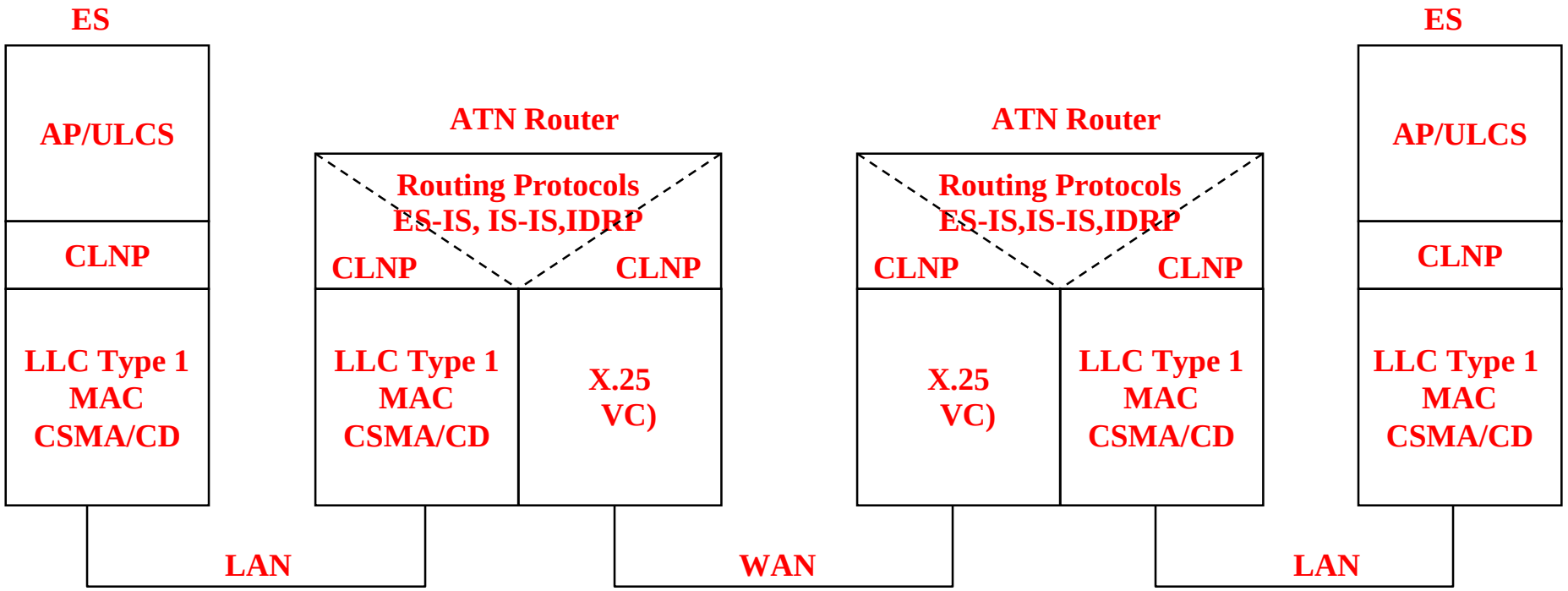
- High-availability Oki router suitable for **BBIS**.



SARPs-compliant Functionality (2)

Data Relay Function

-The OKI ATN Router uses the **CLNP Protocol** to relay application data in accordance with generated routing information.
- **LAN-WAN-LAN**, **LAN-WAN** and **WAN-WAN** connections are supported.



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SARPs-compliant Functionality (3)

Subnetwork (X.25, LAN) Control Function

- The OKI ATN Router supports **X.25** and **LAN** as subnetworks.

(1) X.25

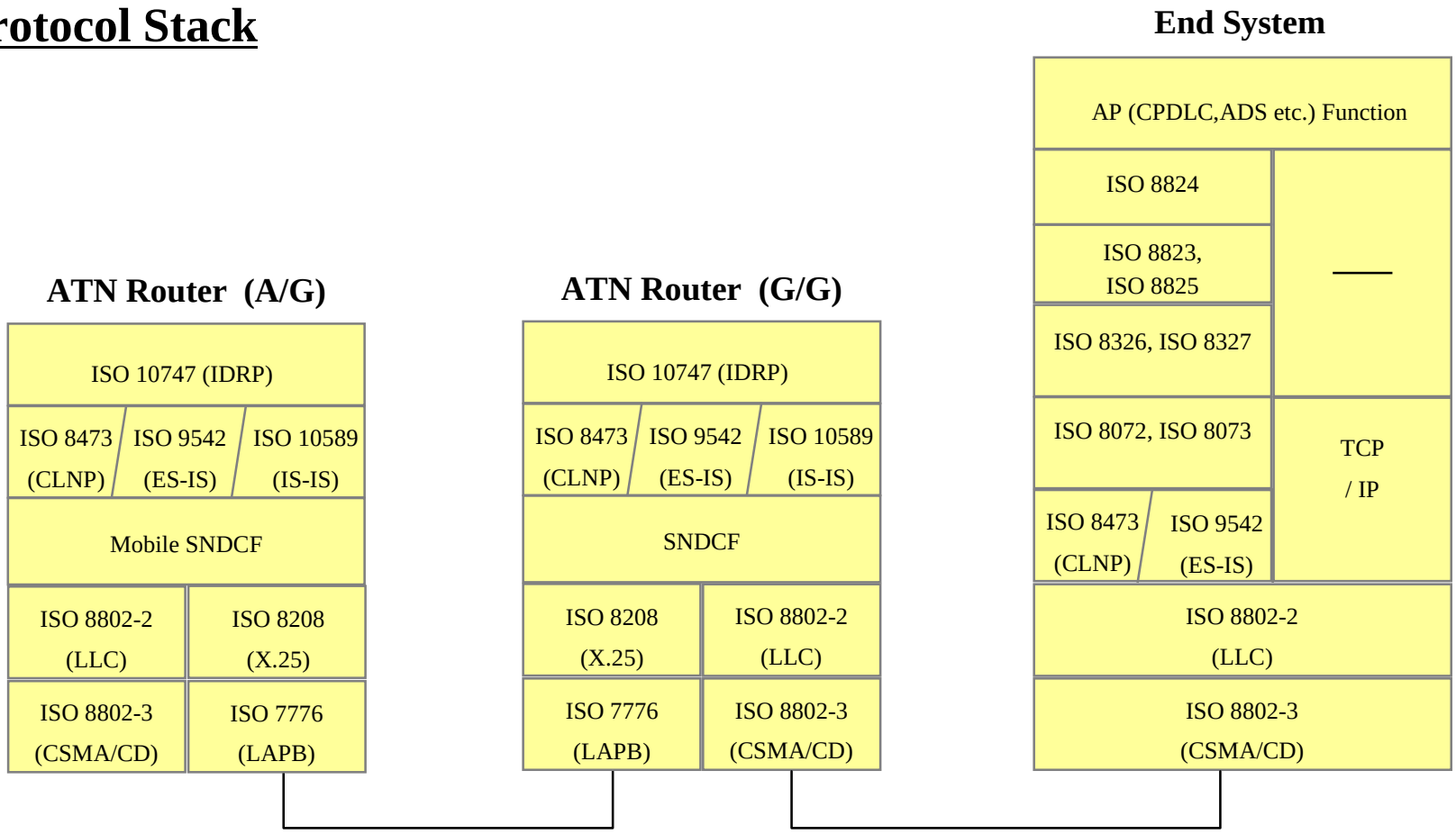
- ATN Router
  - controls incoming and outgoing calls,
  - receives and sends packets, and
  - assembles and disassembles packets.
- VCs (Virtual Call) used for logical channels in X.25.
- V.11/X.21 or V.24/V.28 used for physical interface.

(2) LAN

- ATN Router uses CSMA/CD access method
- LLC Type1 used for logical link control.
- 10BASE-T and 100BASE-T can be used.

SARPs-compliant Functionality (4)

Protocol Stack



Operational Features

OKI ATN Router provides the following functions for operational use:

(1) User-friendly Graphical User Interface-based operator interface

(2) Optional high availability duplex configuration

(3) Remote monitoring capability
Administrative information notification using SNMP* Agent

(4) Historical Log Acquisition
Captures communications logs and system events for diagnostics.

(5) Router Configuration function via Graphical User Interface tool

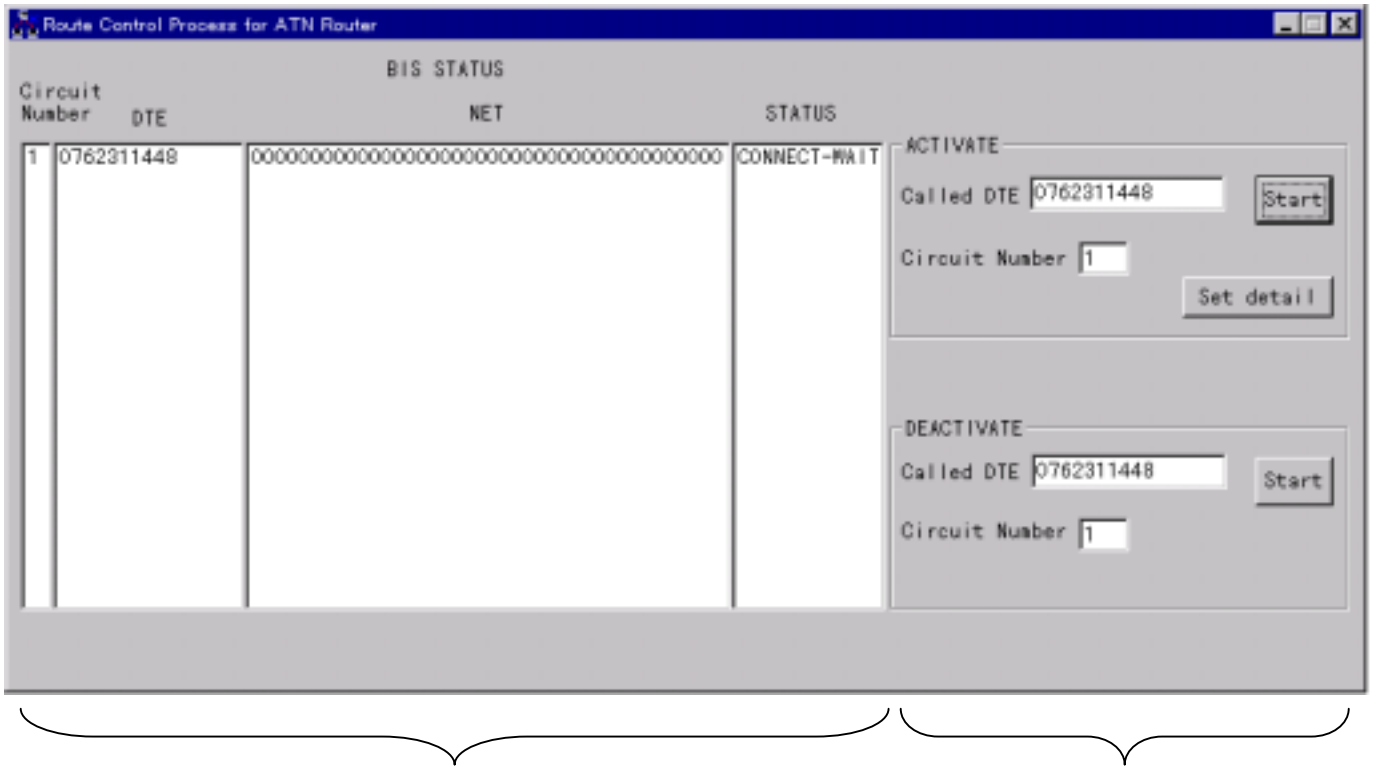
(6) Remote maintenance function

*SNMP: Simple Network Management Protocol

Operating Functions (1)

User Interface (Main Screen)

- This window is used for monitoring BIS connection status
  and for manually connecting and disconnecting BIS connections.



Display Area for BIS connection status

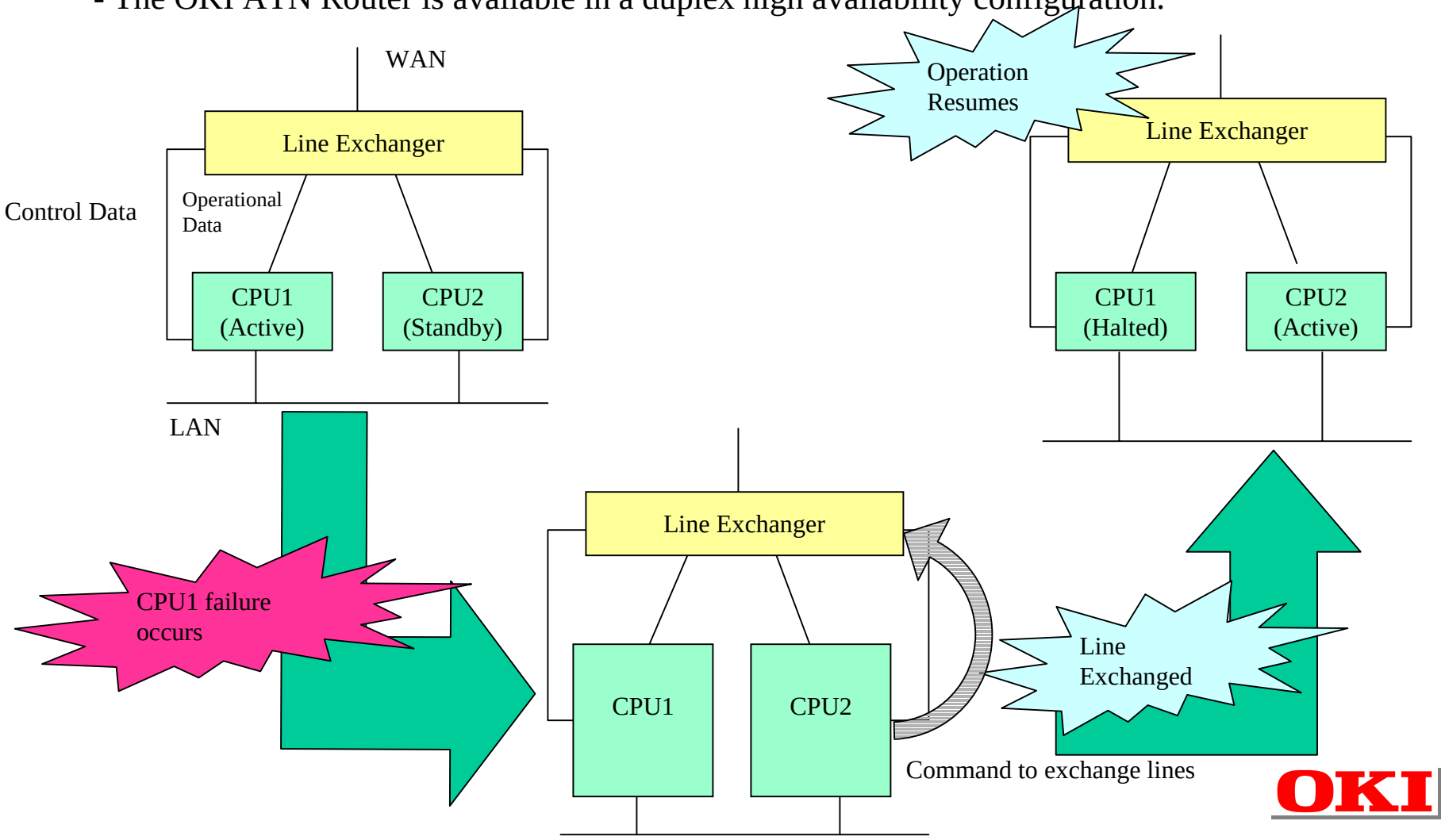
Operation Area for manual control.

-Circuit Number
-DTE
-NET
-STATUS (CONNECT-WAIT, ESTABLISHED, CLOSE-WAIT, CLOSED)

Operating Functions (2)

High Availability using Duplex configuration

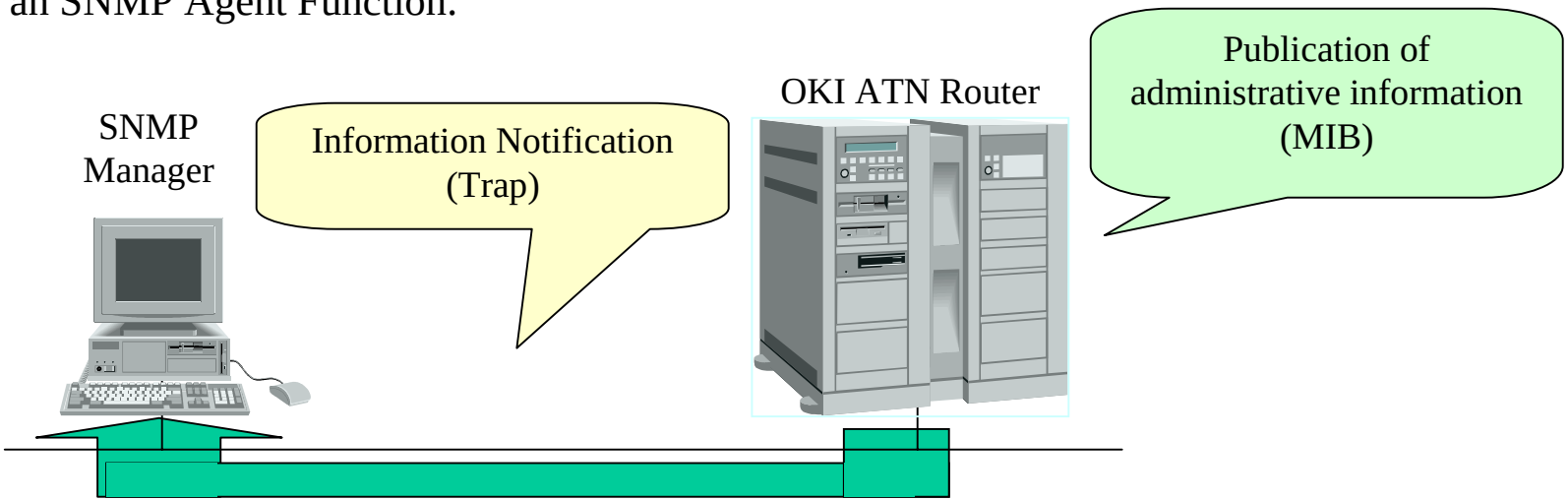
- The OKI ATN Router is available in a duplex high availability configuration.



Operating Functions (3)

Administrative Information Notification using SNMP Agent

-The OKI ATN Router provides administrative information to an SNMP manager using an SNMP Agent Function.



<Extension TRAP>

Successful ATN Router startup

Line Failure/Data Link Failure

Line Restoration/Data Link Reconnected

Equipment Failure occurrence/restoration

Congestion occurrence/clearing

BIS connection/disconnection

<Extension MIB>

Line Status

Operation Status (Status of each node)

Etc.

Operating Functions (4)

Log Acquisition

<Communications Logs>

•Extensive communications logs greatly assist troubleshooting connections to other peer routers, end systems.

•Collectable for from 1-60 days (programmable) on hard disk.

•Can be backed up onto DAT for analysis, archival.

•X.25 communication log

Trace of X.25 and HDLC data.

•Routing protocol logs

Trace of ES-IS, IS-IS, and IDRP data.

•CLNP communication log

Trace of CLNP data.

•SNMP communication log

Trace of PDU parameters (*e.g.* OID) of SNMP.

•Routing Information log

Log of FIB changes due to updates by routing protocol.

<System Log>

System-level logs record router software module events.

•Status Information

Successful/failed startup of ATN Router, etc.

•Diagnostic Information

•Etc.

Operating Functions (5)

Router Configuration Function

- The ATN Router can be configured using an operator-friendly graphical user interface.

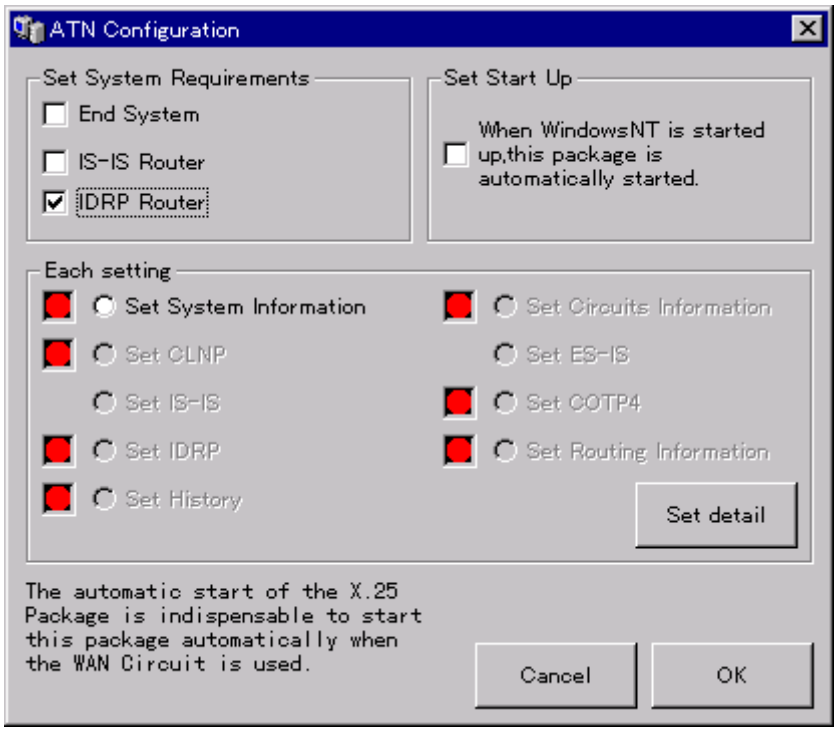


Fig.1 Configuration Tool Main Window

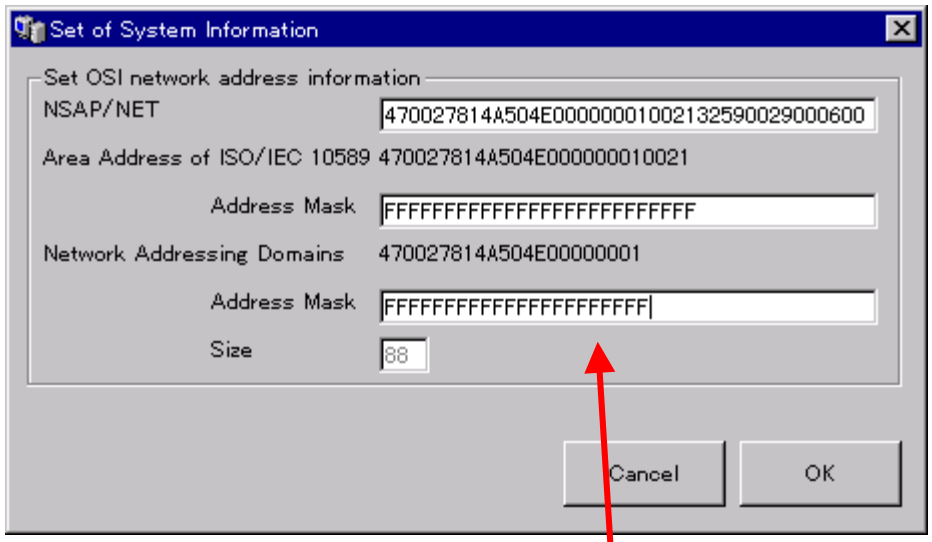


Fig.2 A sub-window
(e.g. Configuration of NSAP/NET)

Configurable Parameters:
NSAP/NET, DTE Address, Security, Peer NSAP/NET, Peer DTE Address, Address Prefix, Packet Size, Window Size, Selection of data to be logged, etc.
The other detailed parameters can be set up by modifying ".ini" files.

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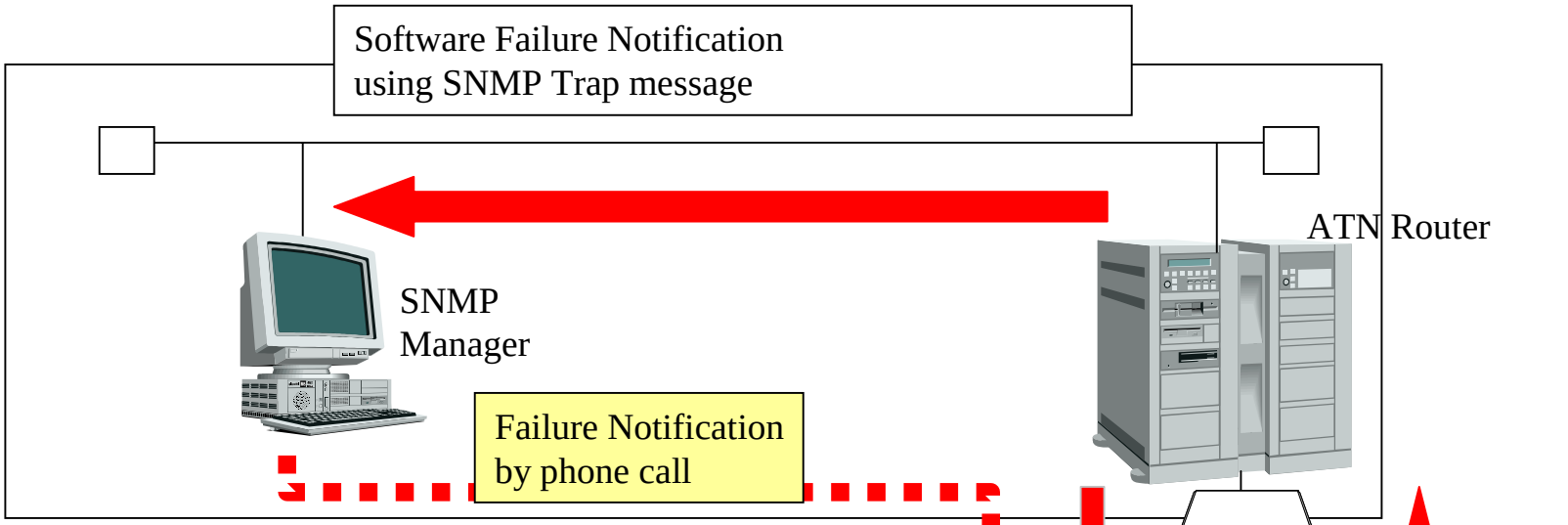
Operating Functions (6)

Remote Maintenance Function



Remote Maintenance Activities

- Restart ATN Router System
- Inspection of logs
- Inspection and Update of Configuration files

OKI's way of thinking for ATN

ATN is an infrastructure to support FANS Systems, Operation

ATN Router development (1995-)

-Accumulation of Know-How and raise of ATN technique by in-house development.

-Construction of validation environment for contribution to ICAO by JAPAN

-Proof of connectivity by Connection Test

-Creation of draft ATN Network design

Study of Human-Machine Interface(1995-)

-Useful man-machine interface in data-link environment

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ATN Router Development Highlights

- •July ’95 ATN Product development initiated
- •Jan ’98 Completion of Initial ATN Router Development
- •Dec ’98 ATN Router Connectivity Test with Eurocontrol
- •Feb ’99 High Availability/High Reliability Router developed
- •Mar ’99 Supplied ATN Router to JCAB for AMHS Applications
- •July ’99+ ATN Router submitted to ARINC for ATNSI Conformance Test Suite
- •Oct ’99+ ATN Router supplied to FAA for its ATN Router Testing Plan (ONS)
- •Dec ’99 ATN Router Connectivity Test with AirServices Australia (AsA)
- •Dec ’99+ CPDLC Application Connectivity Test with Eurocontrol and AsA
- •May ’00 AMHS Connectivity Test with AsA
- •Jun ’00 ADS Connectivity Test with AsA
- •July ’00 A/G ATN Router Developed
- •Mar ’01 Development ATN Security functions started (Doc 9705 Ed. 3)
- •Jun ’01 Loan of ATN Router to HK CAD for evaluation
- •Jul ’01 HK CAD’s use of OKI’s ATN Router for AMHS/ATN Trials with JCAB
- •Aug ’01 HK CAD’s continued evaluation of OKI’s Router

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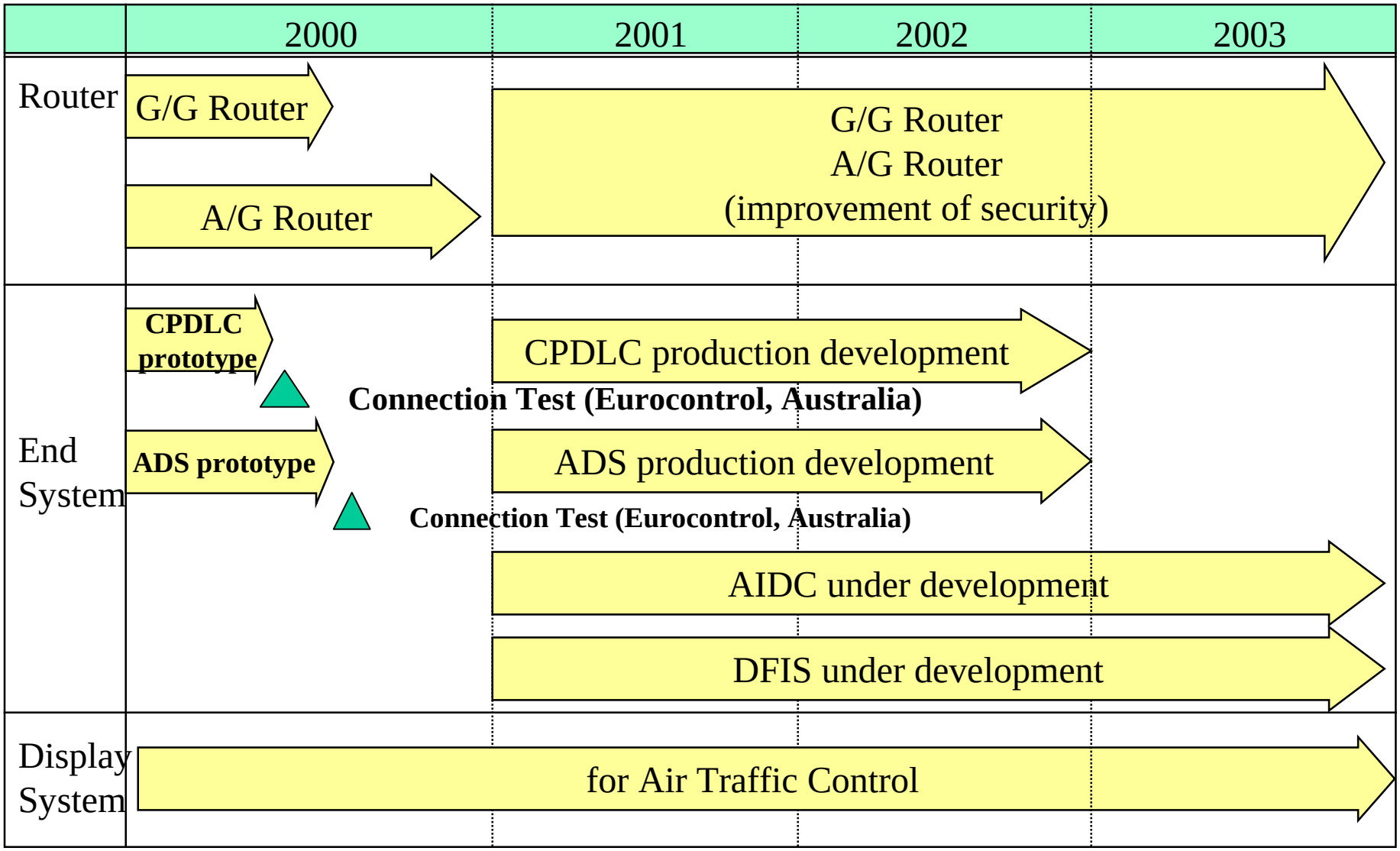
Schedule of ATN Development



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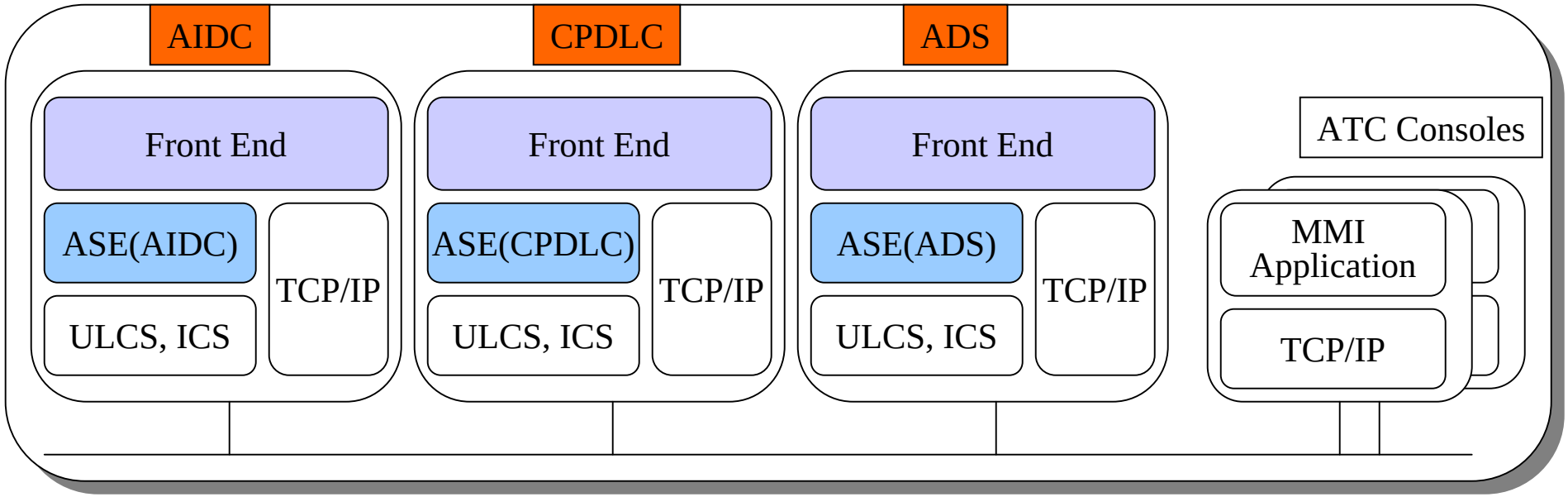
ATN End System Development

- All Oki End Systems are ICAO SARPs-compliant.
  - **CPDLC :** Controller Pilot Data Link Communication
    Under development (-2002).
  - **AIDC :** ATS Inter-facility Data Communication
    Under development (-2002).
  - **ADS :** Automatic Dependent Surveillance
    Under development (-2003).
  - **D-FIS:** Data link Flight Information Service
    Under development (-2003).

End Systems

OKI's consideration of End System Configuration:



What does OKI supply?

End System = Application Protocols (ASE,etc) + Front End (HMI)

for Operation *Standards (Doc9705, etc.)* *Local Operational Requirements*

OKI can supply ES application protocol and ATN network protocol layers.
OKI can supply turnkey End Systems according to local operational requirements.

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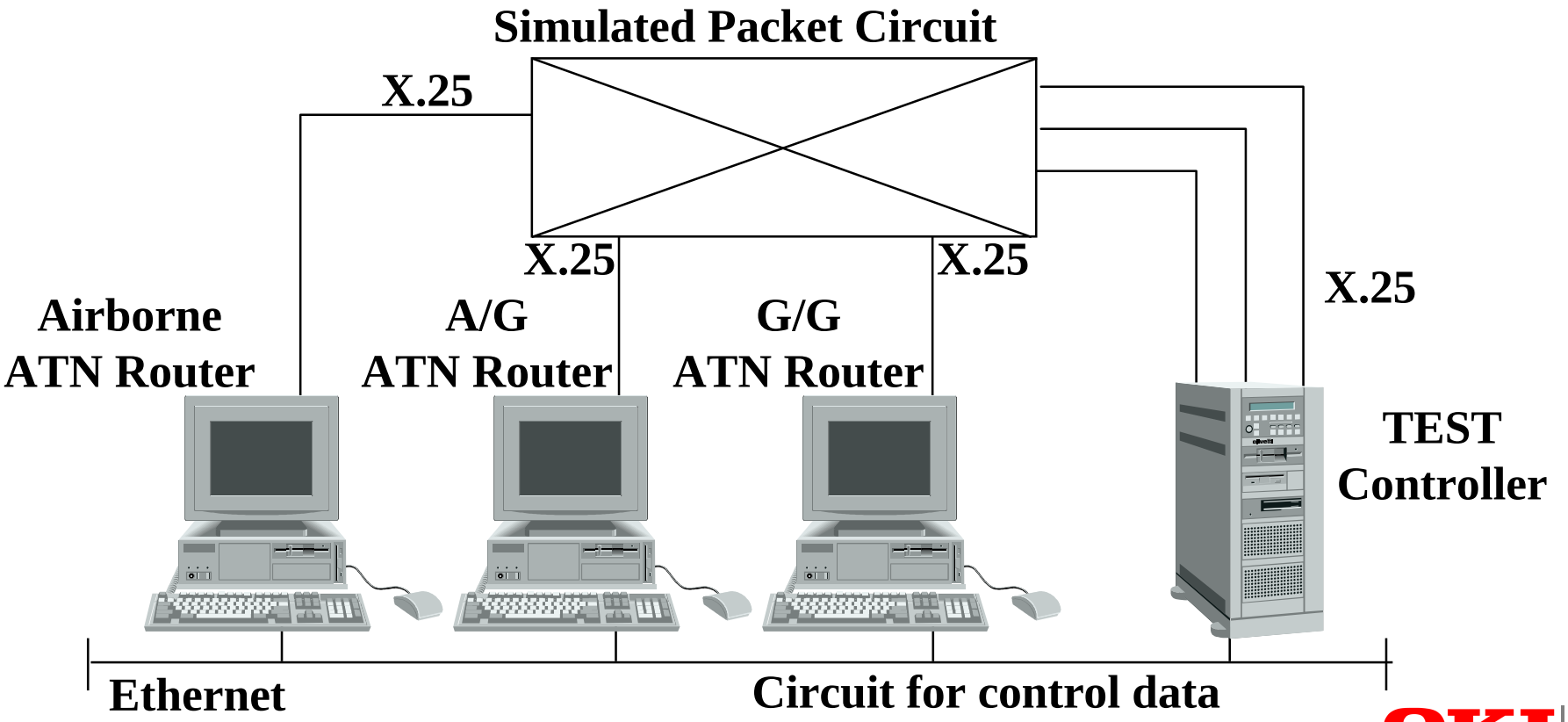
OKI ATN Test Activities

- Carried out by Electronic Navigation Research Institute (ENRI), Japan's main ATC research establishment.
- Carried out by Japan Civil Aviation Bureau (JCAB) IDEC.
- Domestic tests, international tests with Eurocontrol, FAA and AirServices Australia
- Japan-US AMHS service under pre-service trials (start October 2002).

Domestic Experiments (1996-97)

Goals:

- **Confirm connectivity**
- **Measure ATN router perfomance**



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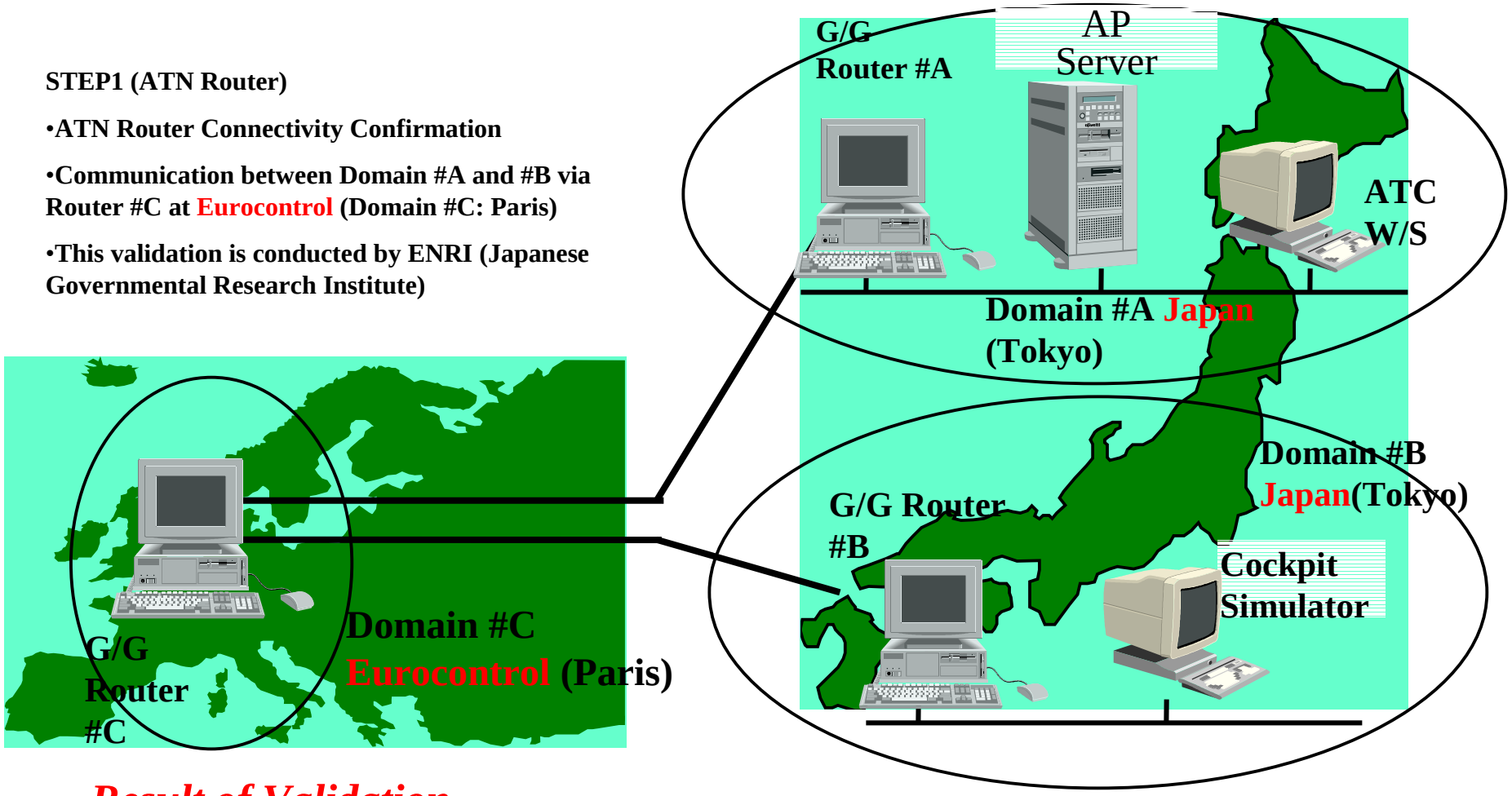
Validation of Connectivity

STEP1 (ATN Router)

- **ATN Router Connectivity Confirmation**
- **Communication between Domain #A and #B via Router #C at Eurocontrol (Domain #C: Paris)**
- **This validation is conducted by ENRI (Japanese Governmental Research Institute)**



Result of Validation

Validation was successfully performed in December 1998.
Test in reverse configuration(1 Japanese Router and 2 Eurocontrol Routers) was also successfully performed in March 1999.
The same test with AirServices Australia was successfully done in December 1999.

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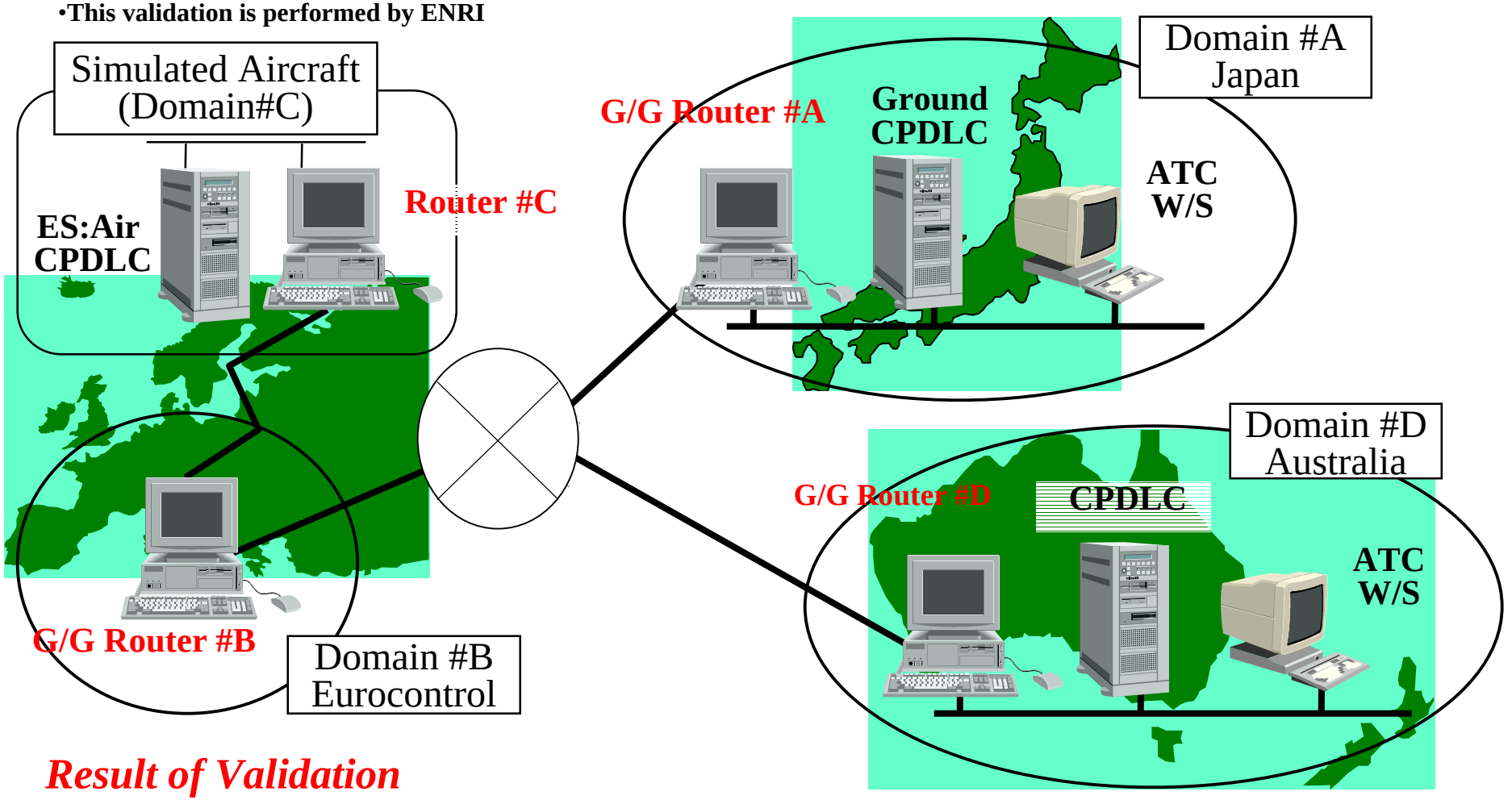
Validation of Connectivity

STEP2 (CPDLC)

- **Connection test of Application and Upper Layers**
- **Communication between Japanese CPDLC and CPDLC at Eurocontrol, Australia**
- **This validation is performed by ENRI**



Result of Validation

Eurocontrol and Australia test was successfully done in December 1999.

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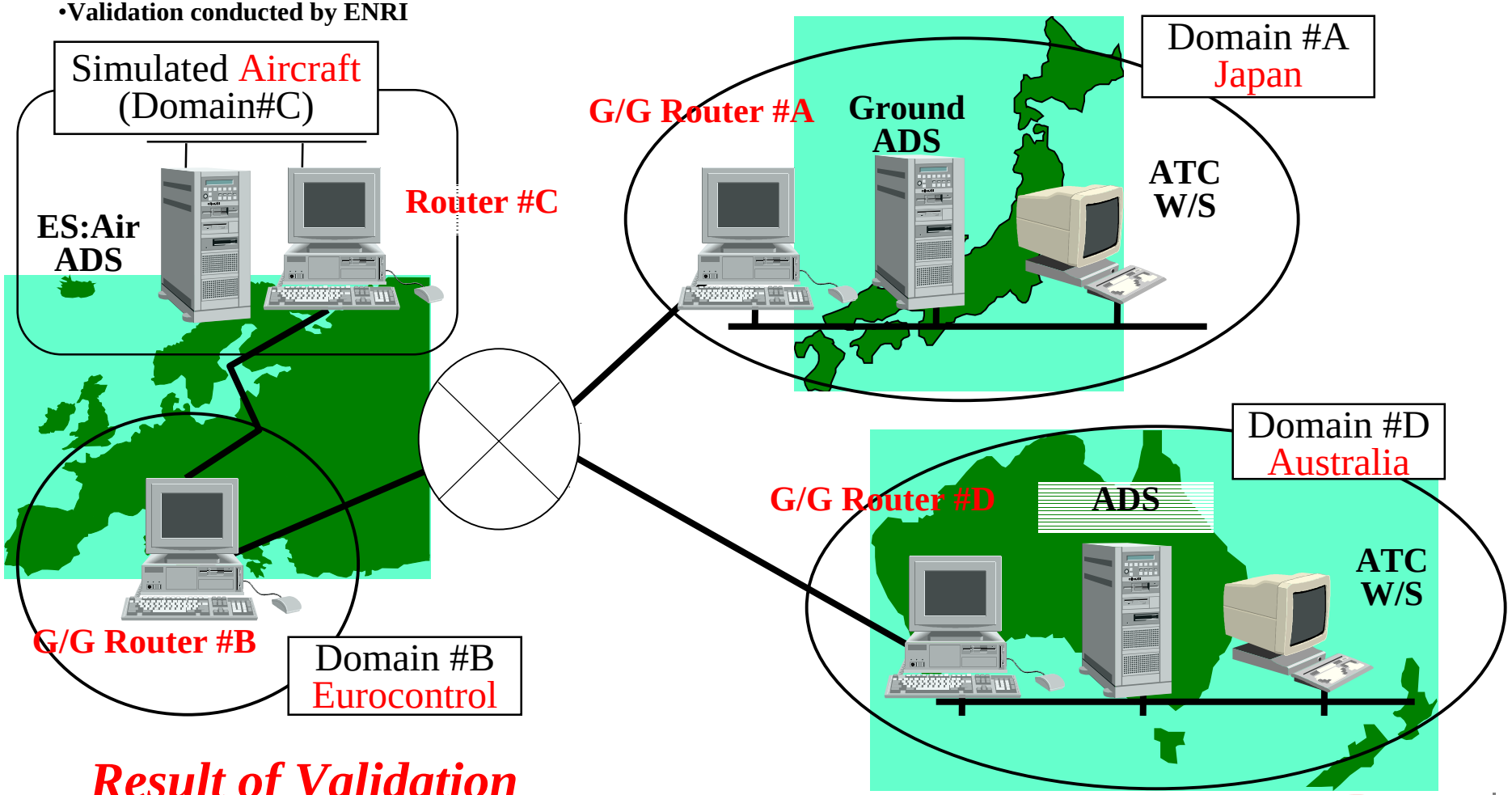
Validation of Connectivity

STEP3 (ADS)

- **Connection test of Application and Upper Layers**
- **Communication between Japanese ADS and ADS at Eurocontrol, Australia**
- **Validation conducted by ENRI**



Result of Validation

Eurocontrol and Australia test was successfully done in May, 2000.

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ANY QUESTIONS?

Contact

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