FIRST/PLANCK SCOS-2000

ESOC - Darmstadt

18th / 19th April 2000

esa

TOS-GC

Agenda

- Welcome (C.Mazza)
- Introduction (P.Estaria)
- SCOS-2000 Status (J-F.Kaufeler)
- EGSE and Supporting Elements (JFK/B.Melton)
- Options for SCOS-2000 Systems (JFK)
- License Agreement / COTS (JFK)
- Support and Service (JFK)

- SCOS-2000 Delta URD (PIs)
- Practical arrangements
- Summary and conclusions

Welcome

➢ **H/TOS-G   Carlo Mazza**

Introduction

➢ **Project   Pierre Estaria**

SCOS-2000 Status

➢ **H/TOS-GC   Jean-François Kaufeler**

Utilisation

> ## **Past**
>> ➢ 1995 SOHO (TLM only)
>> ➢ 1997 Huygens, TeamSat, MTP (Eumetsat)

> ## **Present**
>> ➢ Integral (Successful SVTs)
>> ➢ MSG (successful SVTs)
>> ➢ Rosetta (AD phase)
>> ➢ ERS (1st successful delivery end 1999)
>>> ➢ Migration from SCOS-1
>> ➢ PROBA (MCS + EGSE)

Utilisation

➢ **Future**

- ➢ Smart-1
- ➢ Envisat (migration from SCOS-1)
- ➢ XMM (MOC + SOC) (migration from SCOS-1)
- ➢ Mars-Express
- ➢ First/Planck MOC
- ➢ Earth Core Explorer (Cryosat, GOCE)

➢ **First/Planck EGSE + PIs ??**

Name ?

- **SCOS-2 (until 1998) (up to release R1.4)**
- **SCOS-2000 (from 1999) (from release R2.0)**
  - Is an evolution / improvement from SCOS-2 based on operational experience
  - Differences:
    - New TLC chain,
    - Architectural consolidation
      - MMI fully based on ILOG
      - Systematic use of Object-Store
      - Introduction of CORBA to enable better distribution
      - Introduction of new CORBA based external interfaces

Status of Releases

- ➢ R2.0   Sep. 1999 (Integral SVTs)
- ➢ R2.1   Mar. 2000 (MSG SVTs)
- ➢ R2.2   Sep. 2000 End of nominal project

SCOS-2000 Evolution

➢ **Release 3.0 (mid 2001)**

    ➢ Porting of SCOS-2000 on PC

        ➢ Separation of applications from OS through an OS shell

        ➢ Still some other architectural consolidations

            ➢ Replacement of Object Store

        ➢ 1st porting on LINUX

        ➢ Porting to other OS prepared but not done

            ➢ WNT
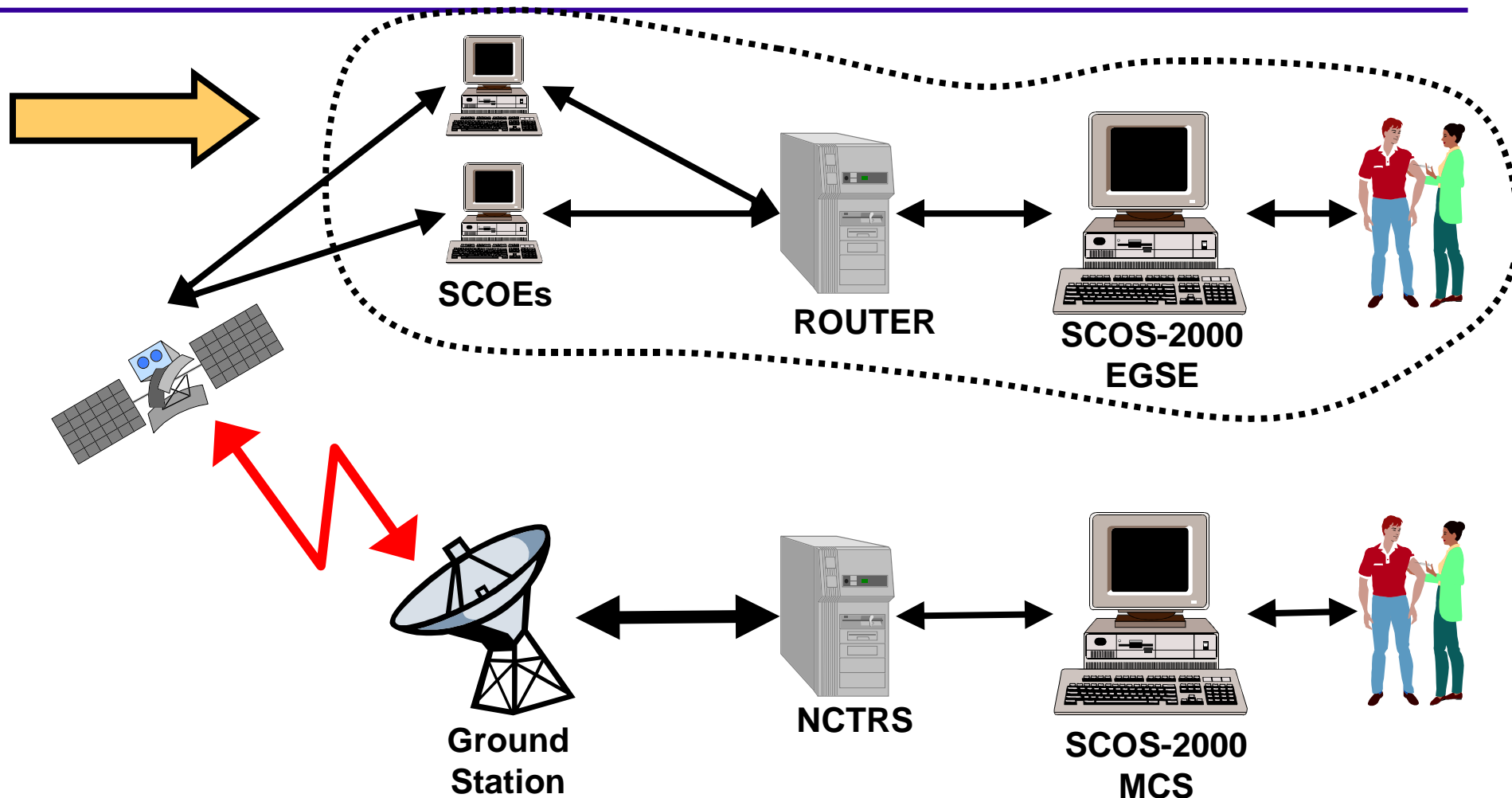
            ➢ Solaris 7 (64 bits)

SCOS-2000 Evolution

➢ **Release 4.0 (1Q 2002)**

  ➢ Allow multiple version of SCOS-2000 on the same machine (e.g. server)

  ➢ To support constellation missions

  ➢ Additional higher level monitoring functions
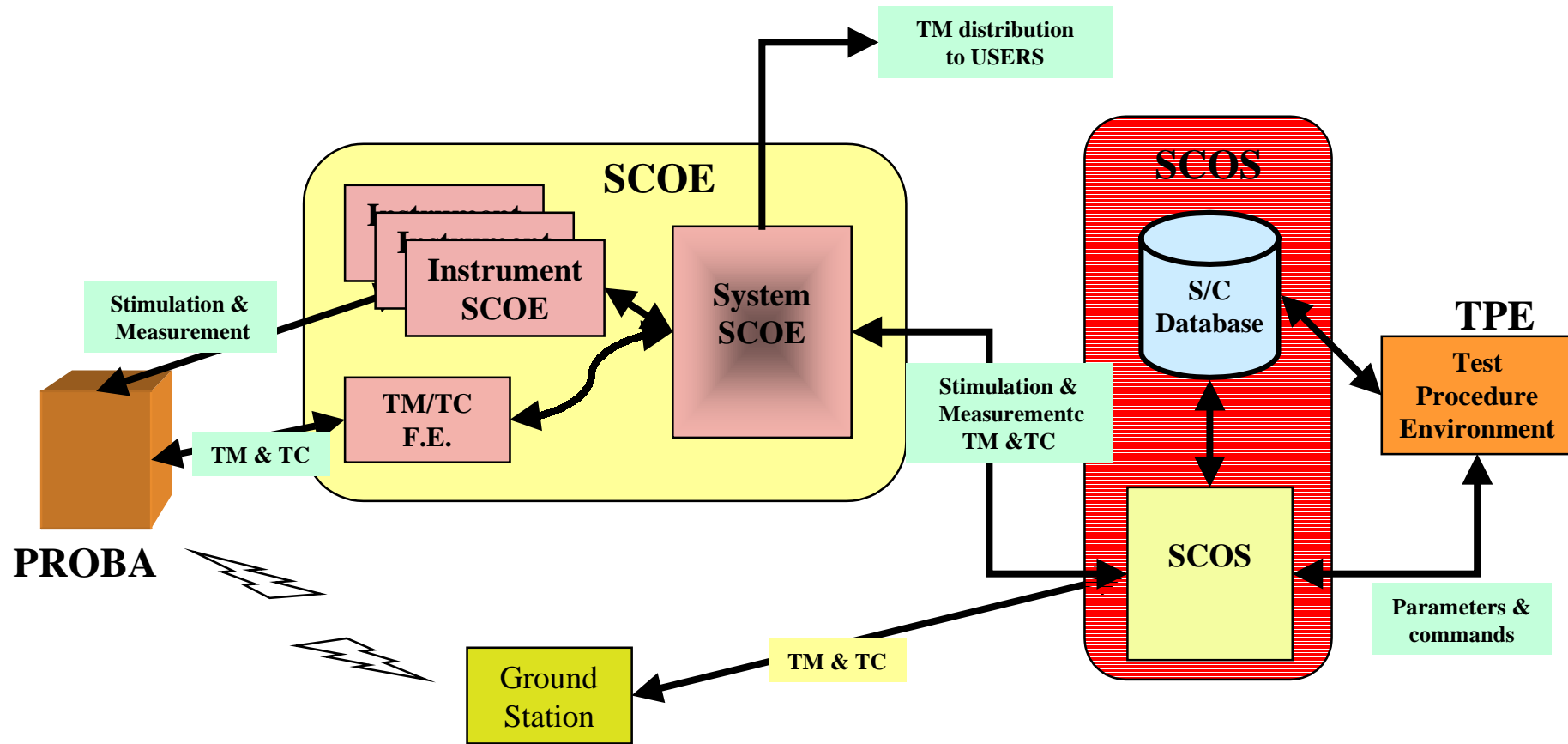
EGSE and Elements

Commonality

SCOEs

ROUTER

SCOS-2000
EGSE

Ground
Station

NCTRS

SCOS-2000
MCS

Main Elements

- ➢ **Checkout facility (PROBA)**
  - ➢ EMCS
  - ➢ Router
    - ➢ TM reception
    - ➢ TC transmission
    - ➢ SCOS gateway
  - ➢ Procedure automation tool
    - ➢ Based on TCL/TK (free SW)
    - ➢ Enables complex procedures
    - ➢ Used for AIV and Operations (PROBA)
  - ➢ Database editors
    - ➢ Based on ORACLE
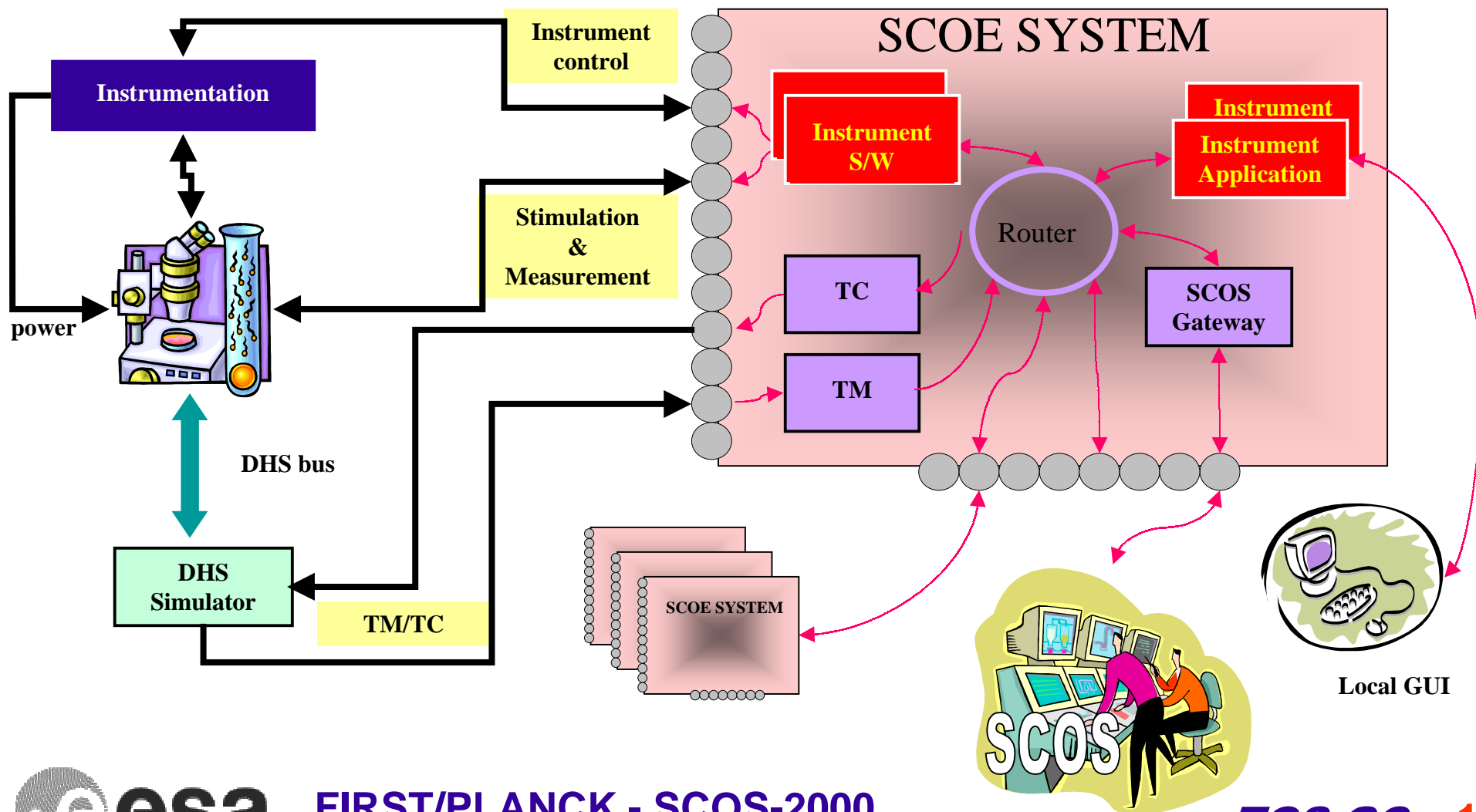
System Level Testing

System SCOE configuration for Integrated System Tests
"An example: Using the MCS configuration."

EGSE-ROUTER

- ➢ The ROUTER provides a core facility for building of SCOE/EGSE equipment in which the system builder can:
    - ➢ incorporate specialised hardware interfaces to the space equipment
    - ➢ incorporate software applications that communicate with the hardware, with each other and with the outside world.
- ➢ It provides :
    - ➢ location transparency
    - ➢ client management
    - ➢ Multiple clients per connection
    - ➢ Data transparency
    - ➢ Message delivery via call back procedure (asynchronous)or polling (synchronous).

EGSE ROUTER

Instrumentation

Instrument control

power

DHS bus

DHS Simulator

TM/TC

Stimulation & Measurement

SCOE SYSTEM

Instrument S/W

Instrument

Instrument Application

Router

TC

TM

SCOS Gateway

SCOE SYSTEM

Local GUI

Performance

➢ **With NT on 366 P3/66Mhz I/O bus**

  ➢ TM 1Mbps input and recorded

  ➢ TM I/f by parallel card in DMA mode (National Instruments)

  ➢ TC 4 Kbps

  ➢ TC I/f by RS422 card

  ➢ CPU load < 15%

 ➢ Distributing data costs ± 2% CPU per virtual channel

SCOS TCP/IP Gateway

- ➢ **The gateway provides connectivity of a PC based EGSE/SCOE equipment with systems using TCP/IP networks**

- ➢ **In PROBA: means to connect to the EGSE and Mission Control System (EMCS)**

- ➢ **No COTS products are required to run the TCP/IP gateway**

TM/TC front end

- ➢ The TM/TC front end provides all functions necessary to:
  - ➢ extract and distribute (CCSDS) telemetry packets from a digital data stream
  - ➢ transform requests for command packet transmission into a digital (CCSDS) data stream.
- ➢ The digital data streams are connectable to:
  - ➢ hardware equipment that interfaces to on-board equipment directly (as in the case of an on board data handling interface simulator)
  - ➢ or indirectly via operational TM/TC links.
- ➢ When using ground-space protocol the TC part requires a COTS product: TC ENCODER SHELL from De lande long Consultants (licence cost approx 10 Keur)

Test Procedure Environment

TCL/TK
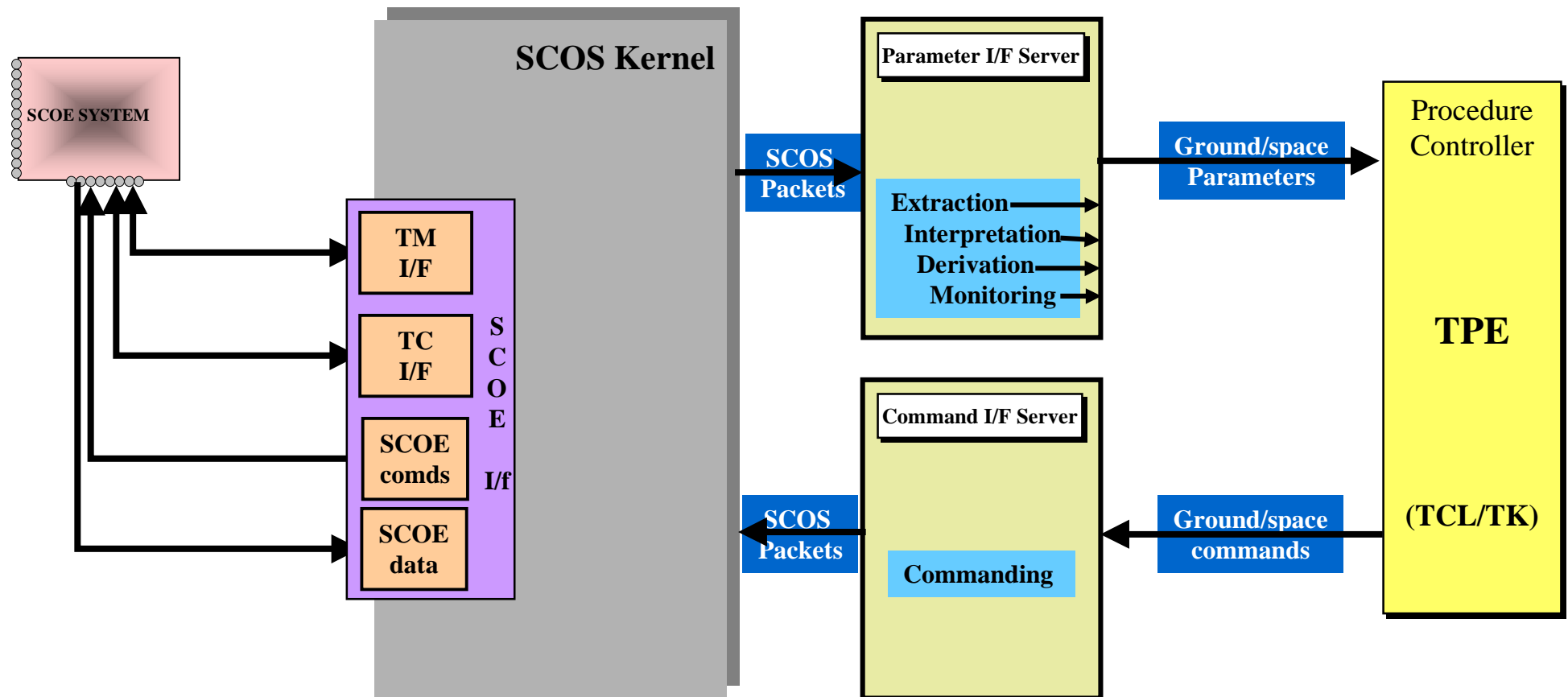
- ➤ http://www.scriptics.com/
- ➤ Tcl is a simple (free) programming language.
- ➤ Tcl scripts are made up of commands with parameters.
- ➤ Tcl provides usual programming constructs such as:
    - ➤ Variables
    - ➤ Control structures
    - ➤ String manipulation.
    - ➤ I/O, including files on disk, network sockets, and devices such as serial ports.
    - ➤ simple facilities for socket communication over the Internet.
    - ➤ File management: reading and writing file attributes, copying, deleting, creating directories,etc.

TCL/TK

- ➢ Subprocess invocation: you can run other applications with the exec command and communicate with them while they run.
- ➢ Lists: Tcl makes it easy to create collections of values (lists) and manipulate them in a variety of ways.
- ➢ Time and date manipulation.
- ➢ Events: Tcl allows scripts to wait for certain events to occur, such as an elapsed time or the availability of input data
- ➢ Extension mechanism to add features (e.g. get parameter, send command, retrieve database info. etc).
- ➢ TK extension to add graphical user interfaces.

PROBA Status & Plan

	Now	End 2000
Elements	SCOS-2 (R1.4)	SCOS-2000 (R2.2)
SCOS-2000	N/A	✓
ROUTER	✓	✓
Automation Tool	✓	✓
DB Editors	✓	☐

Options for SCOS-2000

TOS Offer (SW Only)

- ➢ **Reuse of PROBA elements**
  - ➢ 1   SCOS-2000
  - ➢ 2   Router
  - ➢ 3   TCL/TK procedure automation tool
    - ➢ Powerful language
- ➢ **Additional elements**
  - ➢ 4   Database Editors
    - ➢ based on MS-Access (Integral)
  - ➢ 5   Winfops / MOIS
    - ➢ Based on MS-Access for procedure preparation
    - ➢ Simple automation (tabular form)

TOS Support

- **Option 1**
  - 1,2,3   given as is
  - 4,5   given as is

- **Option 2**
  - Option 1 +
  - 1,2,3   support / service (TOS-G)
  - 4,5   support (TOS-O)
    (can be proposed)
  - Treated as External Customers (New TOS policy)

License Agreement / COTS

License

- ➢ **All SW given free of charge**
- ➢ **License need to formally established**
  - ➢ For non-exclusive use
  - ➢ Stating purpose of utilisation
- ➢ **Does not include provision of COTS**

- ➢ **User (PI) has to provide (procure and finance)**
  - ➢ All the HW
  - ➢ All COTS license

Cost: Core HW

- ## SCOS-2000
  - 1 Server (SUN Ultra 80):   19 Keur
  - 1 Client (SUN Ultra 10):   10 Keur
  - 1 Set of basic SUN SW: 4 Keur
  - Example: 1 server, 2 clients:

  - 1x19 + 2x10 + 3x4 =   51 Keur

- ## ROUTER
  - 1 PC (WNT):   4 Keur

Cost: COTS's

- **SCOS-2000**
  - COTS are
    - ILOG Views, Ctree+, Orbix, ObjectStore, STL lib.
  - Development licenses (STL only)
    - Procurement: 400 Eur / Server
    - Maintenance: 400 Eur / Server / Year
  - Run-time licenses
    - Procurement: 2200 Eur / Client
    - Maintenance: 300 Eur / Client / Year
  - Example:
    - Procurement: 1x400 + 3x2200 =   7.0 Keur
    - Maintenance: 1x400 + 3x300=   1.3 Keur / Year

Cost: COTS's

➢ **ROUTER + Automation Tool**

    ➢ Delphi development environment   1 Keur / PC

        ➢ only if development is required

    ➢ TC transmission   10 Keur / PC

        ➢ SW shell from Mr. De Lang de Long
only required if CCSDS COP1 protocol
is used

Support and Service

Approach

- ## **Support: initial**
  - Installation of an integrated core system and initial training
  - Advisory consultancy for customisation
    - assessment of specific SCOS-2000 requirements
    - assessment of specific SCOE requirements

- ## **Service: permanent**
  - Maintain up to date releases
  - Handling of officially registered SPR's
  - Discussion and negotiation on CRQ's

Approach

- ➢ **SCOS-2000**
  - ➢ Offer for Support (direct charges)
  - ➢ Offer for Service (direct charges)

- ➢ **ROUTER + Automation Tool**
  - ➢ Support is given as part of the EGSE support given to the Project
  - ➢ Offer for Service (direct charges)
    - ➢ 14 Keur / ManMonth / User

SCOS-2000: Support

- ➢ **Preparation for the HW with SCOS-2000 and COTS's installed on site**
  - ➢ Installation
    - ➢ 10 Keur / site (including missions)
  - ➢ Training
    - ➢ Course for developers of 20hours teaching for 4~5 days including hands-on training: 4 Keur / course
- ➢ **Consultancy support for customisation**
  - ➢ Assessment of clients specific requirement and mapping to SCOS-2000 capabilities
    - ➢ 14 Keur / ManMonth / User

SCOS-2000: Service

- ➢ **Assumes SCOS-2000 kernel <u>not</u> touched**
- ➢ **Maintenance contract covering**
  - ➢ Propose and discuss possible change requests
  - ➢ Submit SPR's to be officially registered and prioritised
  - ➢ Receive product updates and support to installation
  - ➢ Member of the SCOS-2000 Board
  - ➢ 35Keur / Year / User

SCOS - 2000 EVALUATION

ESOC 18 - 19 April 2000

P. ESTARIA

SCOS 2000 Evaluation

Introduction

<u>History</u>

- SCOS-2000 (version 0.2) has been evaluated on 3 - 5 November 99 by the RTA CWG as a *possible* candidate for a "framework" system under which to implement a *common* RTA system for the FIRST and Planck Instruments

- Since then, the Instrument groups have been considering an expanded scope for SCOS-2000 namely its utilisation as an EGSE-kernel

- "Requirements" on the system - to cover "missing" RTA functionalities and expected EGSE features - have been captured by PACS in a "*consolidated*" Delta URD (04/04/00)
  - Note: This Delta URD **cannot** be considered consolidated at present

SCOS 2000 Evaluation

- As part of the overall evaluation process ESOC have provided:
    - a draft SCOS-2000 S/W licence agreement proposal
    - A SCOS-2000 Service and Support proposal
    - A description of existing EGSE elements available from other developments (PROBA)

Meeting objectives (See agenda)

- The objectives of the meeting are to explore and discuss all the SCOS-2000 related issues (technical, support, costs schedule, logistics, etc…) in order to provide to the PI groups all the elements required to assist their decision making process

SCOS 2000 Evaluation

FIRST/Planck Project Position

- ESA (D/SCI) overall policy

  - EGSEs are provided by Industry as part of the spacecraft procurement contract (ESA/IPC(89)126)

  - No (minimum of) Agency's deliverable items to Industry - hands-off approach

  - Optimisation of the mission includes the ground segment in the overall system trade-off

  - Commonality/compatibility between Flight Control System and Check Out System shall be pursued within the overall Project constraints (also a goal for Rosetta and MEX)

- The FIRST/Planck Project supports (and has actively pursued with the instrument groups) the concept of commonality/compatibility between the instruments and between the various mission phases

SCOS 2000 Evaluation

- The <u>high level</u> requirements supporting this approach are contained in the AIV specifications (part of the ITT) but <u>no</u> specific implementation is suggested

- Selection (or not) of SCOS-2000 as Instrument EGSE Kernel or in any other function is <u>entirely</u> a PI decision

- The FIRST/Planck Project <u>cannot</u> provide any technical support (manpower + responsibility issue). No technical expertise available within the Project Team

- The FIRST/Planck Project <u>cannot</u> supply any H/W or S/W elements which might be required in order to implement the Instrument EGSEs

- The FIRST/Planck Project <u>cannot</u> finance <u>any</u> of the the costs associated with the use of SCOS-2000 if selected by the PI groups (<u>no</u> financial resources + responsibility issue)

SCOS 2000 Evaluation

This covers both:

- direct costs: cost of hardware, licences, specific developments (e.g. Delta URD), installations, maintenance/support, training, etc…
- indirect costs: via an increase of the MOC CaC

- The FIRST/Planck Project <u>cannot</u> accept any responsibility in case of problems with the selected system

- The FIRST/Planck Project (P. Estaria) has provided up to now overall coordination of the SCOS-2000 evaluation activities. The current phase is considered completed (termination of the RTA CWG). Any future coordination that might be required can <u>no longer</u> involve the FIRST/Planck Project.

SCOS 2000 Evaluation

- Pragmatic implementation of commonality/compatibility should bring substantial overall benefits. These have not been quantified.

Software License

The software items proposed by TOS, which could be used for payload EGSEs are:

1   The SCOS-2000 system
2   The PROBA EGSE system comprised of
      2.1   The Router: SCOS gateway, TM & TC modules
      2.2   The Automation Tool: based on TCL/TK and SCOS interfaces
      2.3   The DataBase: based on ORACLE used for SCOE and Spacecraft data
3   The Integral DB; based on MS-Access used for Integral
4   The Winfops/Mois system: based on MS-Access used to prepare procedures

Per ESA convention for operational software, any ESA member state body (e.g. from the FIRST / PLANCK community) is entitled to apply for a software license for any of the above items, free of charge.

The request for a license has to be addressed to Mr. Steve Wicks (Head of the Contract Division, swicks@esoc.esa.de) at ESOC.

The request should contain:

┌──┐
│ The identification of the requesting organisation   │
│   │
│ The list of software items required   │
│   │
│ The type of license could be: │
│ • Documentation only (password to FTP server will be given)   │
│ • Trial version for a limited duration to be specified (includes documentation)│
│ • The system run-time version (includes documentation)   │
│ • The source code (includes also run-time and documentation)   │
│   │
│ The purpose of utilisation   │
└──┘

A license contract addressing the above points will be sent to the requester for signature. This license is non-exclusive (e.g. other bodies can also request it), and ESA retains the ownership (e.g. it can't be sold to a third party).

After signature the requester will receive the requested software and in case some underlying COTS are necessary, their reference will be given (product id., vendor) and, if applicable, as a reference to ESOC contract with the vendor authorising the deployment of COTS (part of an ESA system, used for an ESA project) at preferential conditions.

Support and Service

In all cases it is assumed that the customer will procure the necessary hardware and COTS license himself.

TOS proposes chargeable Support and Services. These are:

Support:

This addresses the initial phase when the customer is first exposed to the delivered software. It could be:
- Just an installation,
- An installation with teaching how to do it,
- A course on the design of the software and how it can be best used,
- Consultancy to advise the customers how he can met his specific requirements.

Service:

It assumes that the TOS software is untouched by the customer. This addresses a maintenance phase of a duration tbd (and which can be extended) for this software. It includes:
- A helpdesk service to get rapidly advises on utilisation problems,
- Submission of Software Problem Reports (SPR's) which will be fixed in further releases,
- Discussion, planning of Change ReQuests (CRQ's) implementations,
- Receive systematically software updates and getting them installed,
- Member of the software user group.

The requests for Support and/or Services have to be addressed to Mr. Dave Andrews (Head of TOS-PX, dandrews@esoc.esa.de) at ESOC.

The request should contain:

The identification of the requesting body
The definition of which support and/or service is required for which software

An offer will be made to the customer, which after negotiation will result eventually in a contract between TOS and the customer. The contract could be of Fixed Unit Time (FUP, e.g. labour) or Firm Fixed Price (FFP) nature depending on the type of request. All possible combinations can be envisaged and have to be discussed on a case by case basis.

The cost figures indicated in the presentation on 18.04.2000 are indicative and will have to be adapted to the specific request.