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SYSTEM/PROJECT/PRODUCT: STC COMET SYSTEM

COMET

System Handbook

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1. INTRODUCTION

1.1 Purpose

The main purpose of this document is to give a technical description of the COMET system. The document outlines the facilities of COMET that include the UTMC compliant Common Database (CDB).

The issue of this document is the same as the version of the software that it describes.

1.2 Scope

This document covers all the facilities of the COMET system, including background information in terms of the development of the system and aspects of both the hardware and software required to produce a standard single server and multiple client COMET system. The document also details the interfaces to a number of other standard Siemens systems.

Items marked in this manner are not part of the current release of COMET, but may be part of a later edition.

1.3 Related Documents

667/UH/28593/000 System Requirements Specification for COMET

667/HB/28593/000 Operator Handbook for COMET

667/BT/28593/000 Technical Proposal for COMET

1.4 Glossary

ANPR	Automatic Number Plate Recognition
ASTRID	Automatic SCOOT Traffic Information Database
CCTV	Closed Circuit TeleVision
CDB	Common Data Base
COMET	Central Office Management for Integrated Traffic
CORBA	Common Object Request Broker Architecture
CRS	Customer Requirements Specification
DLT	Digital Linear Tape
HTML	Hyper Text Mark up Language
Infodisk	An icon attached to an icon used to indicate a change without changing the appearance of the main icon.
INGRID	Integrated Incident Detection
I/O	Input/Output
ITMC	Integrated Traffic Management Computer
LAN	Local Area Network
PC	IBM Compatible Personal Computer
PSTN	Public Switch Telephone Network
RMS	Remote Monitoring System
ROMANSE	Road Management System for Europe

SCN	System Code Number. The unique identifier associated with either a piece of physical equipment, such as a flow detector, or a combination of equipments, such as a route.
SCOOT	Split Cycle Offset Optimisation Technique
SQL	Structured Query Language
STC	Siemens Traffic Controls
Time Period	The interval between successive items of data, i.e. if a piece of equipment provides data every 5 minutes, the Time Period is 5 minutes
UFE	User Front End
UTC	Urban Traffic Control
VMS	Variable Message Sign
Weighted Average	A smoothing algorithm, which adds a percentage (X) of the current weighted average to “100-X” of the new value to generate the new weighted average.

1.5 Issue State and Amendments

Issue 3a	First draft for review	September 2003
Issue 3	First release	September 2003

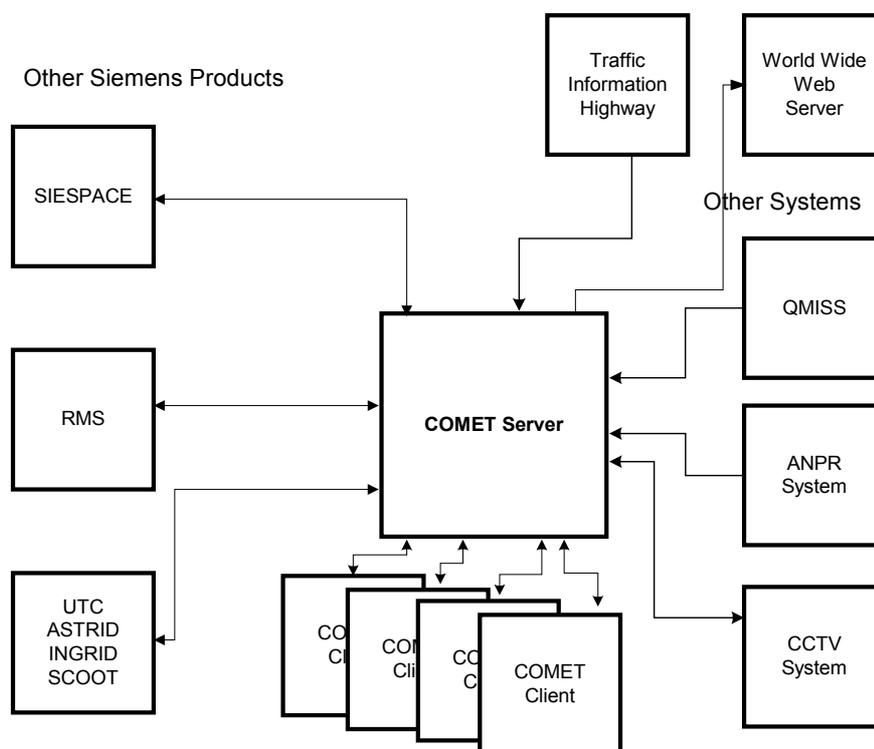
2. OVERVIEW

2.1 Introduction to COMET

COMET is the latest generation of traffic management products from STC. It has been designed to be a replacement for the existing ITMC product, which has been successfully sold in the UK and overseas in recent years. ITMC and its predecessors are products that evolved from developments on several projects throughout the 1990s, principally the ROMANSE system in Southampton.

COMET was designed to build upon the successful features of ITMC whilst making use of modern hardware and software technologies and take into account user feedback on ITMC. The major features of COMET are an integrated traffic database and applications such as route journey time and strategy management. These and other capabilities are described later in this document.

COMET is a major part of STC's traffic systems portfolio. It is fully compatible with other Siemens products, particularly UTC, Siespace (for car park and sign management) and RMS (Remote Monitoring System), using UTM compliant interfaces.



Overview of Comet

2.2 User Interface Overview

The user interface to COMET is browser based. Facilities are selected from a menu to the left of the browser window. Each application appears in a form-style presentation.

COMET also has a map interface. This enables users to view data in a spatial context with items locationally referenced against the map. Combinations of data types can be shown simultaneously on the map. Data can be both static and dynamic depending on the context.

The COMET system supports up to 12 client PCs and 12 UFE sessions.

2.3 Facility List

The list below outlines the main facilities provided by COMET.

- UTMC Common Database with CORBA interface, see section 3.1
- System Log, see section 5.2.3
- Alarms Log with Visual Indication, see section 5.2.4
- Incident Log, see section 5.2.5
- Message Board, see section 5.2.6
- Contacts, see section 5.2.7
- Activity Log, see section 5.2.8
- Strategy Management, see section 5.3
- Route Journey Time Management, see section 5.4
- Map Display, see section 5.10
- Calendar, see section 5.11
- Storage of historic data, see section 5.12
- Generation of profiles, see section 5.13
- Predictions, see section 5.14
- Reports, see section 5.15
- Control of equipment, see section 5.16
- Interfaces to other Siemens systems, see sections 7.1.1, 7.3 and 7.4
- Interfaces to other non-Siemens systems, see sections 7.5 and 7.6.

3. TECHNOLOGY

3.1 Database

The central part of COMET is the UTMC Common Database (CDB). The database holds all important data objects that are required for a modern traffic management system. The database uses SQL with a CORBA interface that allows applications to read and write data in a common way. This allows COMET to operate with a number of systems from various suppliers.

The CDB provides the following facilities:

- Common access to shared data – data held in one system can be made available to another system.
- Flexible data protection and security – each application that uses or supplies data must be registered as an authorised client of the database server.
- A common data service – the CDB stores data and manages the delivery to other applications.

3.2 COMET Software

COMET is constructed from two main components. The first is a database engine, COMET functions with SQLserver as its engine. For UTMC compatibility, access to the database is through CORBA and SQL. To achieve this COMET uses OmniORB Version 4.

The second component is the application to provide user visibility of the database and the functions described elsewhere in this document. Software for these elements generally uses a combination of Java and C++ languages. This requires third party software licences for Java2 run time environment and JDBC drivers.

4. HARDWARE REQUIREMENTS

4.1 Recommended Server Specification

COMET is a PC-based Client-Server product. The server PC must have the following minimum specification:

- Dual Xeon® 1.8 GHz Processor
- Four 73Gb SCSI disks configured as two RAID 1 sets. For implementations where the volume of data is likely to be large, more disks are recommended. See section 4.3 for details.
- 2Gb RAM
- Windows® 2000 Server operating system. Service Pack will be defined in CRS; normally the latest version.
- SQL Server 2000. Service pack will be defined in CRS; normally the latest version.
- An appropriate exchangeable medium for backup/archive, preferably DLT
- Commercial Backup software, preferably VERITAS Backup Exec.
- 10/100 NIC (Twisted Pair)
- PSTN connection for remote diagnosis and support.

The exact specification of the COMET server is defined in the Customer Requirements Specification, which is produced early in the life of a project.

4.2 Recommended Client PC Specification

Client PCs must have the following minimum specification:

- Pentium® IV 2.0GHz
- 512Mb RAM
- 40GB Hard Drive
- 10/100 NIC (Twisted Pair)
- Graphics Card
- CD Drive
- Windows 2000 or Window NT with Service Pack 6
- Internet Explorer 5.5 or later

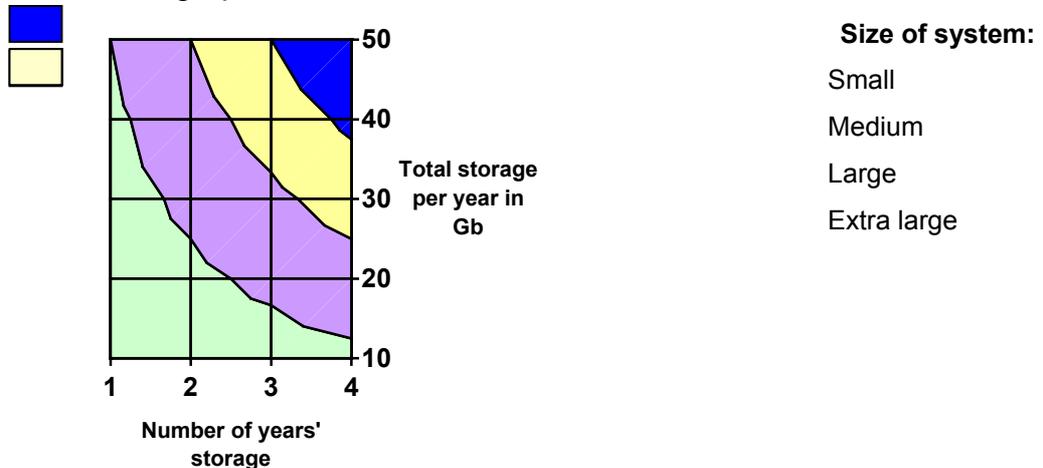
4.3 Data Storage Guide

In order to calculate the size of system required, the following table should be completed.

Data Item	Number	Multiplication factor	Storage per year
Links		*	
Car Parks		*	
Count Site		*	
ANPR link		*	
	Total storage per year		<input type="text"/>
	Number of years' storage		<input type="text"/>
	TOTAL Gb		<input type="text"/>

* These figures will be supplied by Siemens on request.

Then refer to the graph below.



If the size is close to the maximum capacity of one system (i.e. within 10%), it is advisable to consider the next size up to allow room for expansion.

4.4 Expansions and Upgrades

As a result of Siemens' policy of always using the best available technology, the constant evolution of hardware including disks, processors and memory means that it is not possible to determine in advance what will be most suitable. Therefore, upgrades and system expansion would always be the subject of review based on the current best practice and available technology.

5. STANDARD COMET FACILITIES

5.1 User Front End (UFE)

The COMET browser has a menu of facilities for selection by the user. Each facility (with the exception of the map) is implemented as one or more forms known as tabs.

Each tab has the same basic layout with the following facilities (where relevant): add, copy, paste, delete, save and print options.

The UFE:

- Provides the facilities to print the current tab or current table through an 'options' item
- Provides help text covering all items on the browser menu
- Is intended to be a 'thin-client'.

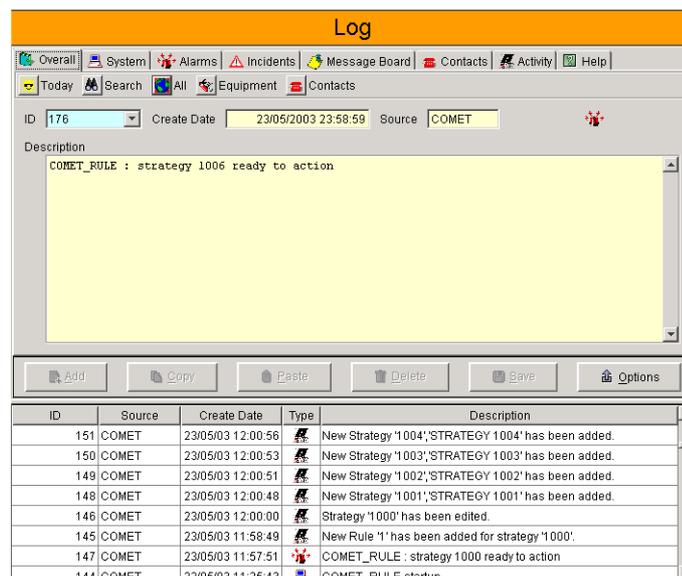
The UFE allows the user to:

- Add information into the system, e.g. strategies and manual log entries
- Copy, paste and delete relevant entries
- Save changes made to the system. If the user tries to leave the current facility without saving the user is prompted to save their changes.

5.2 Log

5.2.1 Introduction

The COMET Logs allow the user to input and monitor significant system events.



The screenshot shows the 'Log' window in the COMET browser. The window has a menu bar with 'Overall', 'System', 'Alarms', 'Incidents', 'Message Board', 'Contacts', 'Activity', and 'Help'. Below the menu bar is a toolbar with 'Today', 'Search', 'All', 'Equipment', and 'Contacts'. The main area displays a log entry with ID 176, Create Date 23/05/2003 23:58:59, and Source COMET. The description is 'COMET_RULE : strategy 1006 ready to action'. Below the log entry is a toolbar with 'Add', 'Copy', 'Paste', 'Delete', 'Save', and 'Options'. At the bottom is a table of log entries.

ID	Source	Create Date	Type	Description
151	COMET	23/05/03 12:00:56		New Strategy '1004','STRATEGY 1004' has been added.
150	COMET	23/05/03 12:00:53		New Strategy '1003','STRATEGY 1003' has been added.
149	COMET	23/05/03 12:00:51		New Strategy '1002','STRATEGY 1002' has been added.
148	COMET	23/05/03 12:00:48		New Strategy '1001','STRATEGY 1001' has been added.
146	COMET	23/05/03 12:00:00		Strategy '1000' has been edited.
145	COMET	23/05/03 11:58:49		New Rule '1' has been added for strategy '1000'.
147	COMET	23/05/03 11:57:51		COMET_RULE : strategy 1000 ready to action
144	COMET	22/05/03 11:25:43		COMET_RULE startup

The Log options are outlined in sections 5.2.3 to 5.2.8.

Equipment and Contacts may be searched from any Log tab.

5.2.2 Overall Log

The Overall log contains the contents of all the logs.

5.2.3 System Log

The System Log contains details of COMET activities. Entries generated by other sub-systems are not included, but do appear in the Overall Log (section 5.2.2).

A message is recorded in the log at the start up and close down of COMET, including the date, time and message text.

Individual strategies have their start and finish times recorded.

Information is recorded in the following manner:

- Valid operator commands that affect equipment are recorded with a unique numeric ID, creation date, source and description.

The system allows the user to:

- Sort the log by the ID, creation date, source and description.
- Search through the log by the source, description and date fields, and reset the search parameters so all entries in the database are returned.

5.2.4 Alarms

Alarms are incident or system messages that are deemed important enough to draw to the attention of the operator. The alarms tab displays all alarms to the user and allows them to be acknowledged.

The alarms tab allows the user to:

- View the ID, source, create date and description of alarm entries in the database.
- Acknowledge a single alarm or all alarm events.
- Search through alarm events by the description, source, status and date fields, and reset the search parameters so all entries in the database are returned.

The title bar on all facilities flashes red when an alarm event is triggered unless the visual indication has been disabled via desktop configuration (section 5.8).

5.2.5 Incidents

The Incidents Log:

- Automatically records incidents detected by e.g. INGRID.

The Incidents Log allows the user to:

- Manually add incidents.
- Select an Operator for the incident if the current user is different from the logged-on user.
- Search any field
- Delete incidents that are no longer relevant.

5.2.6 Message Board

The Message Board is a place for users to record information of their choice. This might be a note for other operators, records of phone calls or actions taken.

The message board facility allows the user to:

- Create a new message with an automatically generated unique ID, along with the creation date.
- Select an Operator for the message if the current user is different from the logged-on user.
- Add free text in the description field.
- Delete messages that are out-of-date or no longer required.

5.2.7 Contacts

The Contacts tab is a place for operators to record and search useful phone numbers and addresses, FAX numbers, e-mail addresses or any other details of persons or organisations associated with the operation of their system.

5.2.8 Activity Log

The activity log contains details of operator actions. Each activity message is assigned a unique ID automatically when it is created and can be selected subsequently from the list provided.

The Activity log may be searched by login, description or date.

5.3 Strategy Management

5.3.1 Introduction

Strategy management consists of configuration, selection by form and selection by map. These options are outlined in sections 5.3.2 to 5.3.4.

The screenshot shows the 'Strategy Configuration' window. The form includes the following fields and controls:

- Strategy ID:** 1000
- Strategy Name:** STRATEGY 1000
- Strategy Location:** Test Location (with a 'New' button)
- Direction:** INBOUND
- Incident Type:** Accident
- Automatic Selection:** (Manual Selection:)
- Re-enable Period:** 5 minutes
- Available:**
- Current State:** Inactive
- Number Configured:** 7

Below the form is a table of existing strategies:

Strategy ID	Strategy Name	Current State	Auto Select
1000	STRATEGY 1000	Inactive	Y
1001	STRATEGY 1001	Never Run	N
1002	STRATEGY 1002	Never Run	N
1003	STRATEGY 1003	Never Run	N
1004	STRATEGY 1004	Never Run	N
1005	STRATEGY 1005	Never Run	N
1006	STRATEGY 1006	Never Run	N

5.3.2 Strategy Configuration

Strategy configuration allows the user to group a set of commands together. These commands can be set up to run automatically or they can be flagged up to the user to select the task to run manually once the criteria have been satisfied. Strategy configuration consists of the following tabs – header, commands, rules, rule logic, schedule and help.

Strategy configuration:

- Displays the current state of a selected strategy along with the number of strategies configured in total.
- Displays all valid SCN trigger points for the chosen trigger type, and trigger string, if valid.
- Uses rule logic to enable the user to define a set of rules that need to be satisfied to run a strategy automatically. This is done with selection of AND/OR/NAND/NOR Boolean operators.

Strategy configuration allows the user to:

- Enter a numeric ID for a strategy in the range of 1,000 to 999,999.
- Configure strategies to run automatically, or be flagged up to run manually. An automatic strategy can be run manually, but a manual strategy cannot be run automatically.

- Schedule the time of day the strategy is available for automatic implementation.
- Input a strategy name, location and direction as free text.
- Enter a new strategy location or select from the drop down list.
- Select the incident type.
- Define a re-enable period of 0 to 1440 minutes for a strategy.
- Define the actions to be taken when a strategy is run.
- Select from three time types for each command: absolute time, delta time and repeat time.
- Add commands in the range of 1 to 999.
- Select a time value from 00:00 to 23:59 for each command.
- Select a destination for the command e.g. UTC.
- Enter a command string for each command, which is executed by the sub-system defined in the destination field.
- Add rules to a strategy in the range of 1 to 10.
- Define one of a number of trigger types for each rule. The configured trigger types are:

Car Park Occupancy	Profile Car Park Occupancy
Car Park State	Profile Detector Flow
Congestion	Profile Detector Occupancy
Environmental CO	Profile Link Congestion
Environmental NO	Profile Link Modelled Flow
Environmental PM10	Profile Travel Time
Environmental SO2	Profile Route Journey Time
Flow	Queue
Incident	Route Journey Time
Link Travel Time	Speed
Meteorological Temp	UTC Remote Request
Occupancy	
- Define an up and down threshold value in the range of 0 to 9,999 for a rule.
- Define the up and down time for a rule in the range of 0 to 999 minutes, and percentage, if valid.
- Define the availability of a strategy by selecting the time of day the strategy is available to run.
- Configure and action a strategy that action commands in multiple sub-systems.
- Search through strategies.

The strategy command line is not verified for correct syntax by COMET. The user must ensure that the command entered is correct in both syntax and reference to equipment on the sub-system to which the command is to be sent.

5.3.3 Strategy Selection by Form

The strategy selection form provides the user with the means of querying the strategy database to identify the strategy to be run.

The strategy selection form:

- Displays the number of selections found.

The strategy selection form allows the user to:

- Reduce the list of strategies displayed by selecting one of the following fields:
 - Strategy location
 - Incident Type
 - Direction
- Define the strategies to be listed via a numeric range.
- Display the full list of strategies.

5.3.4 Strategy Selection by Map

This facility allows strategies to be implemented and cancelled directly from the map.

- Right clicking on a strategy icon produces a hierarchical (and possibly directional) list of strategies related to the location.
 - Implement/Cancel – Attached to the implement option are all relevant inactive strategies and attached to the Cancel key are the active ones. If no strategies are active, the cancel option is not displayed.
 - Direction
 - Incident type
- Once a strategy is highlighted the signs affected by the strategy are identified, see section 5.10.6.

5.4 Route Journey Time Management

COMET is capable of calculating route journey times as the sum of the times for constituent parts of a route (termed segments or links). These segments break a route down into manageable parts. For each segment, data is either fixed (if no means of acquiring live information exists) or variable, where detection is available.

Route Journey Time Management has the following tabs: header, time of day, segments, journey times and help.

Route Journey Time Management

Header | Time of Day | Segments | Journey Times | Help

Search All

Route Identifier: N11113A

Route Name: ROUTE N11113A

Route Start: _____

Route End: _____

Route Via: _____

Route Type: Normal Route Length: 0

Current JT: 22 Timestamp: 20/01/2003 00:00:30

Add Copy Paste Delete Save Options

Route ID	Route Name	Route Type	Current JT	Timestamp
mfr	ROUTE mfr		20	20/01/03 00:00:30
N11113A	ROUTE N11113A		22	20/01/03 00:00:30
N11114A	ROUTE N11114A		3	20/01/03 10:18:37
N11115A	ROUTE N11115A		184	20/01/03 15:11:21
N11116A	ROUTE N11116A		88	20/01/03 14:04:17
N11117A	ROUTE N11117A		6	20/01/03 12:04:22
N11118A	ROUTE N11118A		0	12/09/02 08:24:50

Route journey time management:

- Displays the route journey times in seconds.
- Displays the current journey times for a selected route along with a timestamp showing both the date and time.
- Generates a graphical display to show the actual, current and historic journey time values.

Route journey time management allows the user to:

- Add a new route (normal or bus) to the database with an alphanumeric ID
- Calculate journey times based on a defined set of links.
- Calculate journey times for bus routes based on a sequence of detection points
- Add a route to the system with the following fields:
 - Route Identifier
 - Route Name
 - Route Start
 - Route End
 - Route Via
 - Network Reference
- Define the segments for the route by adding in segments with a user defined numerical field.
- Search through routes.
- Display all route entries in the database.
- For each segment:
 - Select a route identifier

- Add a segment ID in the range of 1 to 99
- Select a segment ID
- Associate a link with the segment. A link can be associated with more than one segment.
- Select a link description
- Input a start and end description field
- Input expected journey times (if no detector exists) for peak AM, PM and off peak times in the range of 0 to 9,999 seconds.
- Input the segment and route length in the range of 0 to 99,999 metres
- Display the route name, current journey time and timestamp for each segment ID.

5.5 Equipment Configuration

Equipment configuration provides the facility to add equipment into the COMET system. Some types of equipment are updated automatically, for example via UTC. Other equipment needs to be added manually.

Equipment configuration:

- Displays to which sub-system the equipment belongs.

Equipment configuration allows the user to:

- Select the type of equipment to be viewed by selecting the equipment type
- Select a specific equipment SCN
- Add a new equipment SCN with:
 - A short description
 - A long description
 - Easting and Northing (7 digits) start and end
 - One network link reference. E.g. OSCAR, SATURN.
 - A user reference (where a customer might have a different name or number for equipment)

5.6 User Accounts

This facility allows the system administrator to manage user accounts.

User accounts:

- Uses the users PC login (username and password).
- Allows multiple Administrators to manage and configure user accounts.
- Allows the administrator to add in a username of up to 25 characters.
- Allows administrators to configure whether users should have access to individual parts of the system.

- Allows equivalent usernames to be configured for all sub-systems for which proxies are available.

5.7 System Configuration

System configuration allows some system parameters to be configured.

System configuration:

- Provides the facility to configure the lifetimes of the Incident Log (1 to 90 minutes)
- Allows the Strategy log to be enabled and disabled.
- Allows a number of operator names (maximum 25 characters) to be associated with a specific username.
- Allows the user to maintain, manage and define incident types (maximum 30 characters).

5.8 Desktop Configuration

Desktop Configuration allows the user to personalise the COMET desktop environment.

Desktop configuration:

- Allows the user to configure the colour of the user defined fields and system fields.
- Provides an option for the visual indication of alarms to be switched on or off.
- Allows log confirm dialog boxes to be switched on or off.

5.9 Session Management

This facility will be removed in later versions.

The “facility in use” flag is used to prevent more than one user from having access at any one time. It is possible that the in use flag is still present even when the user has exited the facility.

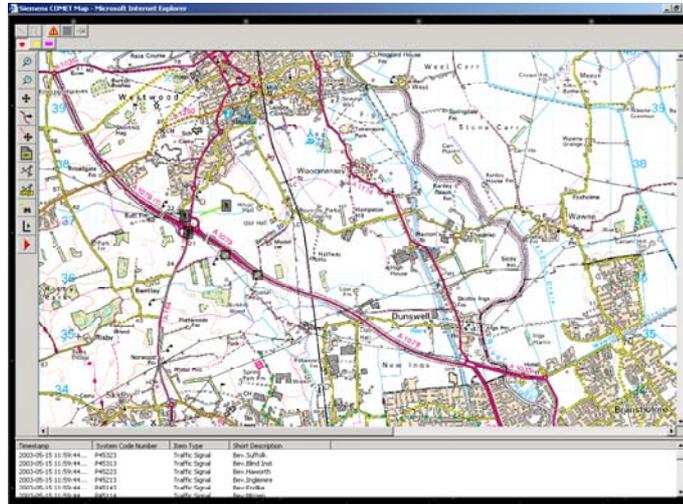
The COMET system allows the user to reset the “facility in use” flag.

5.10 Map

5.10.1 Overview

The Map facility displays information on scaled maps. The information is obtained from systems such as UTC or Siespace, or entered by the operator(s). The information is then displayed using either colour or a changed

shape to represent different states. E.g. a flashing red icon indicates a new incident, a line changing colour indicates a change in journey time along a route. Additional information is also available by hovering the mouse over an icon or line.



5.10.2 General Facilities

The map facility:

- When an event or equipment has an associated grid reference, it is possible for COMET to display the event in the correct position automatically on the map. In this context 'event' includes incidents. Grid references may be defined in COMET or supplied with the data.
- Allows the system administrator or operator to configure or add an item.
- Allows the user to reference the map by location.

5.10.3 Start-up/Shutdown

At start-up the following information is displayed:

- The view of layers that were saved on exit.
- All incidents that have not been closed

The operator has the option to save on exit. If this option is not selected, all incidents that have not been closed are displayed by default.

5.10.4 Poly Lines

Each poly line displays the following facilities:

- Layer (filter) option.

- Displays congestion information with the same colours as SCOOT congestion (configurable).
- Relevant data values for equipment when a user 'hovers' over a poly line.
- Allows the user to create, copy and paste poly lines.

5.10.5 SCOOT Data

The map facility:

- Displays actual congestion and flows with the same colours (configurable) as the UTC system.
- Displays comparative data for congestion and flow and route journey times. The poly line flashes red when thresholds are exceeded and yellow when values fall below the normal range.

5.10.6 Icons

Icons:

- Are configurable, i.e. the operator can switch off selected icons if they are not required.
- Are added by the system administrator, apart from the incident icon.
- Hovering over an icon displays the text description held in COMET; the icon displays the ID (which can be switched off by the operator).

The following icons are displayed on the map:

- Incident icon(s)
 - It is possible for the operator to place an incident icon on the map. Information about the incident can then be logged through an, automatically displayed, form
 - When placing the incident, the operator can choose from a standard list of incidents, each of which has a different icon. The operator can also "switch off" incident types.
- Strategy selection icon(s) access the database to list the strategies available for that location via drop down menus.
- Fixed information icon(s)
 - Display the position and ID of fixed sites e.g. CCTV cameras
 - Allow the user to select a bitmap and place the icon on the map.
- Variable message sign icon(s)
 - Show the current information displayed on the sign when the mouse pointer is held over the icon

- Automatically clear the fault when it is cleared by the sub-system
- Change colour when a strategy is run that affects a VMS sign
- Allow the system administrator to configure the VMS icon(s) to clear down when a clear all signs strategy is run
- Depict conflicting strategies on an icon with an infodisk.
- Queue and occupancy icon(s) indicate when queue and/or occupancy detectors trigger and automatically clear when the trigger has cleared.
- Intersection icon(s) indicate when fault events are raised and automatically clear when the event has cleared.
- Car Park icon(s) also display the occupancy and state.

5.11 Calendar

COMET stores data in both raw and profile form. Profiles describe the data that is recorded for a typical day, or a type of day. The types of day are defined using the calendar facility, so that profiles can be maintained for each day type. There are sufficient day types to allow for the varying patterns of traffic caused by Schools, Universities, Markets, Bank Holidays, weekends, etc. In larger systems, it may be necessary to have different holidays for different areas of the network. During the day events can occur which mean that the data for the day should not be included in the profile e.g. a major accident, unusual weather.

Date	Reason for Abnormality
14/01/03	test
15/01/03	test future

- The Calendar allows at least 60 unique day types to be defined.
- The Calendar allows a single day type to be associated with dates for at least 10 years into the future.

- A day type can be associated with either:
 - A single date each year, e.g. Christmas, New Years Day, May Bank Holiday.
 - A date range together with day(s) of the week. E.g. School Terms.
- The following day types are pre-defined:
 - Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday
 - New Years Day, Good Friday, Easter Monday, May Day, Late Spring Bank Holiday, Late Summer Bank Holiday, Christmas Eve, Christmas Day
 - Term times
- It is possible to mark a day, past or future, as abnormal and not to be included in any profile.

5.12 Historic Data

Historic data is the record of information that has been sent to the system, together with any data generated by COMET. The content of the historic data depends upon the linked systems and is variable. It may include flow information sent every five minutes by a UTC system, Journey Time information sent every hour by an ANPR system or car park occupancy information sent every 30 minutes from a car park system.

As this raw data gets older, there is less reason to store it. Older data is mostly used to look for trends and to make rough comparisons with other data. The system generates summary data allowing the older raw data to be removed from the system. This facility is subject to a separate licence.

The stored data is used to generate reports and profiles.

- The following data is stored:
 - All Raw Data provided by external systems. E.g. Flow, Journey Times, Car Park Occupancy, Faults, etc
 - Operational Information from COMET. As a minimum this occurs on:
 - a. Operator login
 - b. Operator logout
 - c. COMET start
 - d. COMET shutdown
 - e. Sub-system link established
 - f. Sub-system link broken
 - g. Change made to COMET configuration, although not the exact details.
 - h. Command sent to external system.
 - Summary data
- All data is time stamped in the source system. E.g. Data from external systems use the time stamp provided with the data. The operational log is time stamped by COMET.

- For disaster recovery, it is possible to back up the entire database to a file whilst the system is on-line.
- For disaster recovery, it is possible to restore the entire database.
- It is possible to archive data older than a user configurable period to file(s) whilst the system is on-line. In this context, 'archive' means removing the data from the on-line database in such a way that it can be restored if desired.
- It is possible to insert archived data into the database whilst the system is on-line.
- There is the facility to backup file(s) to removable media. The removable media includes:
 - DLT drive (preferred)
 - DAT tape
 - CD-ROM
 - DVD
 - Removable Hard drives
- Where configured, the system can provide a warning when the disk space used by the database exceeds a limit. This warning is integrated into the COMET user interface.
- Where configured, there are different periods for archiving data for:
 - Raw data
 - Operational Information
 - Each type of summary Data
- The system creates summary data as follows:
 - Monthly in hourly chunks
 - Quarterly in 3-hour chunks
 - Yearly in 24-hour chunks
- Where data needed to create the Summary Data is missing then the period is marked as suspect:
 - If more than 5 minutes of an hourly chunk is missing
 - If more than 15 minutes of a 3-hour chunk is missing
 - If more than 2 hours of a 24-hour chunk is missing

5.13 Profiles

COMET stores data in both raw and profile form. The profile is intended to describe the data that is recorded for a typical day, or a type of day. The types of day are defined using the Calendar facility, allowing profiles to be maintained for each day type. During the day, events can occur which mean that the data for the day should not be included in the profile e.g. a major accident, unusual weather.

It is possible to configure Strategy Rules so that when a profile for an SCN exceeds a preset percentage, a strategy is triggered if it is set to run automatically, or the operator is alerted if the strategy is manual.

The map can also be configured to trigger a colour change for a category of icons when a preset percentage over profile is exceeded.

Profile Configuration

Header Help

Data Type: Car Park Occupancy Number of Equipments: 70

Algorithm: Weighted Average Number of Profiles: 117480

Day Type: Monday

Weighting Factor: 10 % (100% means don't use any history)

Add Copy Paste Delete Save Options

Data Type	Algorithm	Day Type	Weighting Factor
Car Park Occupancy	Weighted Average	Monday	10
Car Park Occupancy	Weighted Average	Tuesday	10
Car Park Occupancy	Weighted Average	Wednesday	10
Car Park Occupancy	Weighted Average	Thursday	10
Car Park Occupancy	Weighted Average	Friday	10
Car Park Occupancy	Weighted Average	Saturday	10
Car Park Occupancy	Weighted Average	Sunday	10
Car Park Occupancy	Weighted Average	Monday School Holiday	10
Car Park Occupancy	Weighted Average	Tuesday School Holiday	10
Car Park Occupancy	Weighted Average	Wednesday School Holiday	10
Car Park Occupancy	Weighted Average	Thursday School Holiday	10
Car Park Occupancy	Weighted Average	Friday School Holiday	10
Car Park Occupancy	Weighted Average	Public Holiday	10
Car Park Occupancy	Weighted Average	Spare 1	10

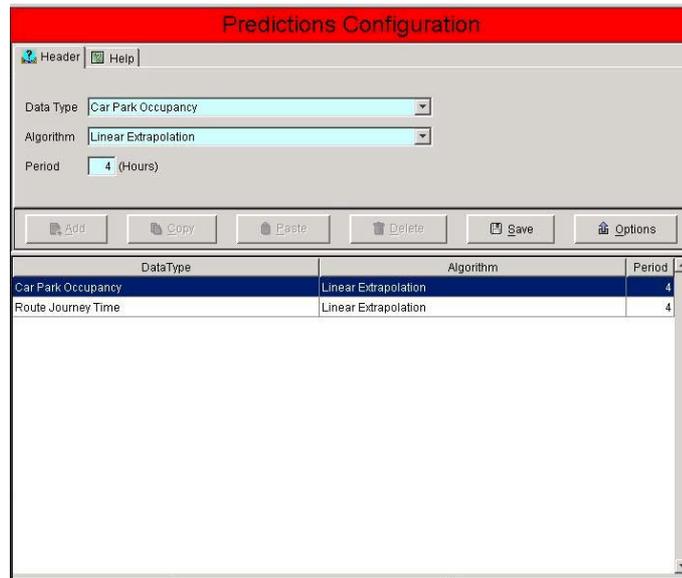
- A profile is maintained for:
 - Each day type.
 - Each item of data. E.g. Count Site, Car Park, ANPR link
 - Each type of numeric data E.g. Flow, Occupancy, Journey Time, Car Park Occupancy.
 - Each Time Period in the day

This means that for each 'period of the day' for each of the 'day types', there is an entry in the profile for each 'item of data' for each 'type of data'.

- The algorithms to be used in calculating the profile are Average Continuous or Weighted Average.
- For the Weighted Average algorithm the user can set the percentage of the new data to be used.
- An algorithm is associated with each type of data. E.g. Journey Times, Car Park Occupancy, Flow.
- An algorithm is not changed by the source of data. E.g. Journey Times from UTC and ANPR are processed in the same way.
- The profiles are up to date by 06:00 on the following day.
- The profiles are recalculated if:
 - The date is set to 'not to be included' or
 - The type of day is changed
- If some of the data required to generate a profile is not available on-line then the profile is calculated without the data.
- If data is missing for a period, then the profile is not updated.

5.14 Predictions

COMET makes use of the profile and current value to indicate what might happen to the selected parameter in the near future. For example, how long will my journey to work take, and will a car parking space be available when I arrive?



DataType	Algorithm	Period
Car Park Occupancy	Linear Extrapolation	4
Route Journey Time	Linear Extrapolation	4

The prediction is calculated by taking the current value and applying linear extrapolation to the profile data for a selected number of hours in the future.

5.15 Reports

COMET stores a lot of information, some of it raw data from external systems, some operational information generated by COMET and the remainder information processed by COMET into summary form. The reporting facility is intended to allow this information to be viewed, printed and exported.

Date	System Code Number	Occupancy	Occupancy Percentage
02/06/03 03:21:38	C14131	162	31
02/06/03 04:06:29	C14131	172	33
02/06/03 04:15:46	C14131	166	31
02/06/03 04:26:14	C14131	162	31
02/06/03 04:41:33	C14131	160	30
02/06/03 04:56:43	C14131	146	28
02/06/03 05:16:29	C14131	142	27

- The user is provided with a simple to use facility that specifies the data to be presented in the report. The facility allows one or more ranges to be selected, dependent on the report.
- All reports, unless specified otherwise, are sorted in time and date order with the oldest data first.
- A report displays the first page of data as soon as it is available, without waiting for all data to be retrieved.
- The user can export the data to file in comma separated variable (CSV) format.
- The date and time is placed in the report in such a way that when the exported CSV file is imported into Microsoft Excel, the date and time are processed by Excel and seen as a date.
- The system does not ensure a report contains data prior to starting the report generation.

5.16 Control of Equipment on other Systems

This facility is subject to a special licence.

See also section 7.

COMET collects data from a variety of sources to provide operators with an overview of what is being reported by a number of systems. This means that the operator may see congestion reported by the SCOOT part of the UTC System, may be told that the journey time in the same area has increased radically and may also be told that the environmental sensors are detecting more carbon monoxide.

- The following sub-system command formats are supported:
 - STC UTC, both Junctions and Pelicans
 - STC Siespace, both Car Parks and VMS.

- Where configured, there is a 'lifetime' period for each supported sub-system.
- If a command is still present after the 'lifetime' has expired, the command is deleted and this action logged.
- The data to operate the above menu system is available through the UTMC interface.

6. COMET FACILITIES REQUIRED BY UTMC

6.1 Introduction

The COMET system database and interfaces is UTMC compliant. This compliance is achieved by active participation in the UTMC29 trial projects and by adopting a positive approach to working with other industrial and local government partners.

As part of the learning process to date, some important facilities connected with the provision of a UTMC compliant database have been identified. The following sections briefly describe these.

6.2 Data Security

Security for CDB data is provided through access protection to each data object (table). User applications are required to supply the correct privileges (i.e. username and password) in order to be granted connection to the database. These privileges are controlled and managed by the database administrator.

6.3 Subscription

The CDB supports subscription whereby applications may subscribe to particular data items and rely on the CDB to inform them when changes of data occur. Sub-systems wishing to take advantage of this facility use the methods defined by UTMC10 and are as a result able to subscribe to any CDB data that their user access rights permit.

6.4 Quality

The CDB supports the quality model as proposed by the UTMC10 project. Quality tables are available for creation and amendment by database administrators. Each data object for which quality is an issue has a reference to the quality model.

6.5 Control

Control is the term to be used for allowing one sub-system to effect an operation on another, for example a user front end sub-system setting a legend on a VMS. The CDB has the ability to hold control commands. COMET also holds data, which enables controlling applications to inform the user of the available control facilities. COMET manages the control data area as part of the CDB and performs the necessary housekeeping functions, e.g. handling commands that cannot be actioned when sub-systems are off-line.

As a minimum, control is available for the following equipment types when operating with Siemens UTC or Siespace:

- Car Parks
- Variable Message Signs
- Junctions
- Pelicans

7. EXTERNAL INTERFACES

7.1 Introduction

COMET interfaces to a wide variety of Siemens systems, including UTC, Siespace, and RMS. An overview of each of these systems and details of the interface are outlined below. The interface to external systems is also outlined.

The COMET system interfaces to the Siemens systems using CORBA over a TCP/IP network. The data to be transferred to and from each sub-system and the time intervals for updates is outlined in sections 7.2 to 7.6.

Interfaces to systems from other manufacturers are available through the CORBA interface.

7.1.1 Requirements on External Systems

- The commands to be supported are defined in APPENDIX A.
- The STC UTC and Siespace systems read, action and delete the commands.
- The STC UTC and Siespace systems provide a status response to the appropriate COMET object.

7.2 Urban Traffic Control (UTC)

Siemens UTC provides traffic control in an area. The system uses SCOOT to monitor traffic flow in real-time to update traffic signal timings to match the current conditions. The system also uses ASTRID and INGRID software packages. ASTRID stores essential information provided by SCOOT to provide information on the performance of the network. INGRID uses two types of algorithm to detect incidents. Once an incident is detected, it is reported to the UTC traffic control computer.

7.2.1 Data Transfer (UTC and COMET)

The information that is exchanged is defined in the UTMC Data Objects Registry. In this version, the data is updated every five minutes. This is subject to change.

7.3 Siespace

Siespace is used throughout the UK to guide motorists to vacant parking areas, avoiding incidents and delays. Siespace provides motorists with accurate and up-to-date information, allowing an informed choice to be made about the best parking options and traffic conditions. The system provides data handling and control facilities plus a general information display. In a 'stand-alone' situation, Siespace analyses the number of free spaces in each car park or parking zone, and then determines the appropriate messages to be displayed on Variable Message Signs.

7.3.1 Data Transfer (Siespace and COMET)

The information that is exchanged is defined in the UTMC Data Objects Registry. In this version, the data is updated every five minutes (subject to change).

7.4 Remote Monitoring System (RMS)

The Siemens Remote Monitoring and Control System provides an easy to use and highly reliable facility enabling the efficient monitoring and management of a wide range of “on-street” equipment. Equipment monitoring is performed by an Outstation monitoring and Control Unit (OMCU) that can easily be installed in most equipment housings. Fault and status reporting is via PSTN or GSM network.

7.4.1 Data Transfer (RMS and COMET)

The information that is exchanged is defined in the UTMC Data Objects Registry. In this version, the data is updated every five minutes (subject to change).

7.5 Tyco Closed Circuit Television (CCTV)

7.5.1 Data Transfer (CCTV and COMET)

The information that is exchanged is defined in the UTMC Data Objects Registry. In this version, the data is updated every five minutes (subject to change).

7.6 Automatic Number Plate Reading System (ANPR)

7.6.1 Data Transfer (ANPR and COMET)

The information that is exchanged is defined in the UTMC data Objects Registry. In this version, the data is updated every five minutes (subject to change).

7.7 Linking to other non-Siemens Systems

Systems that comply with UTMC protocols are able to read/write data from the COMET CDB.

APPENDIX A COMMANDS SUPPORTED BY CONTROL

System	Command	Equipment Type	Parameters
STC UTC	DEMA	Junction	UTC Stages
STC UTC	DEMA	Pelican	UTC Stages
STC UTC	FALL	Junction	
STC UTC	FLTY	Junction	Fault categories
STC UTC	FLTY	Pelican	Fault categories
STC UTC	IHPC	Junction	Fault categories
STC UTC	IHPC	Pelican	Fault categories
STC UTC	IHRW	Junction	
STC UTC	IHRW	Pelican	
STC UTC	ISOL	Junction	
STC UTC	ISOL	Pelican	
STC UTC	LLNK	Junction	
STC UTC	PLAN	Junction	Plan Numbers
STC UTC	PLAN	Pelican	Plan Numbers
STC UTC	SYNC	Junction	
STC UTC	XDEM	Junction	UTC Stages
STC UTC	XDEM	Pelican	
STC UTC	XFAL	Junction	
STC UTC	XFLT	Junction	Fault categories
STC UTC	XFLT	Pelican	Fault categories
STC UTC	XIHP	Junction	Fault categories
STC UTC	XIHP	Pelican	Fault categories
STC UTC	XIHR	Junction	
STC UTC	XIHR	Pelican	
STC UTC	XISO	Junction	
STC UTC	XISO	Pelican	
STC UTC	XLLN	Junction	
STC UTC	XPLA	Junction	
STC UTC	XPLA	Pelican	
STC UTC	SCOO	Node	
STC UTC	SCOO	Region	
STC	XSCO	Node	
STC	XSCO	Region	
STC Siespace	SIGN	Sign	Legend_Id - where Legend_id is the identifier of up to 4 characters for the appropriate legend.
STC Siespace	XSIG	Sign	
STC Siespace	SIGN	Sign	Legend_Id and number_of_spaces - where Legend_id is the identifier of up to 4 characters for the appropriate legend.
STC Siespace	VEHC	Car Park	Occupancy
STC Siespace	SPAC	Car Park	Number of spaces
STC Siespace	CAPA	Car Park	Capacity
STC Siespace	CARP	Car Park	State - where State is one of OPEN or CLOSED.

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