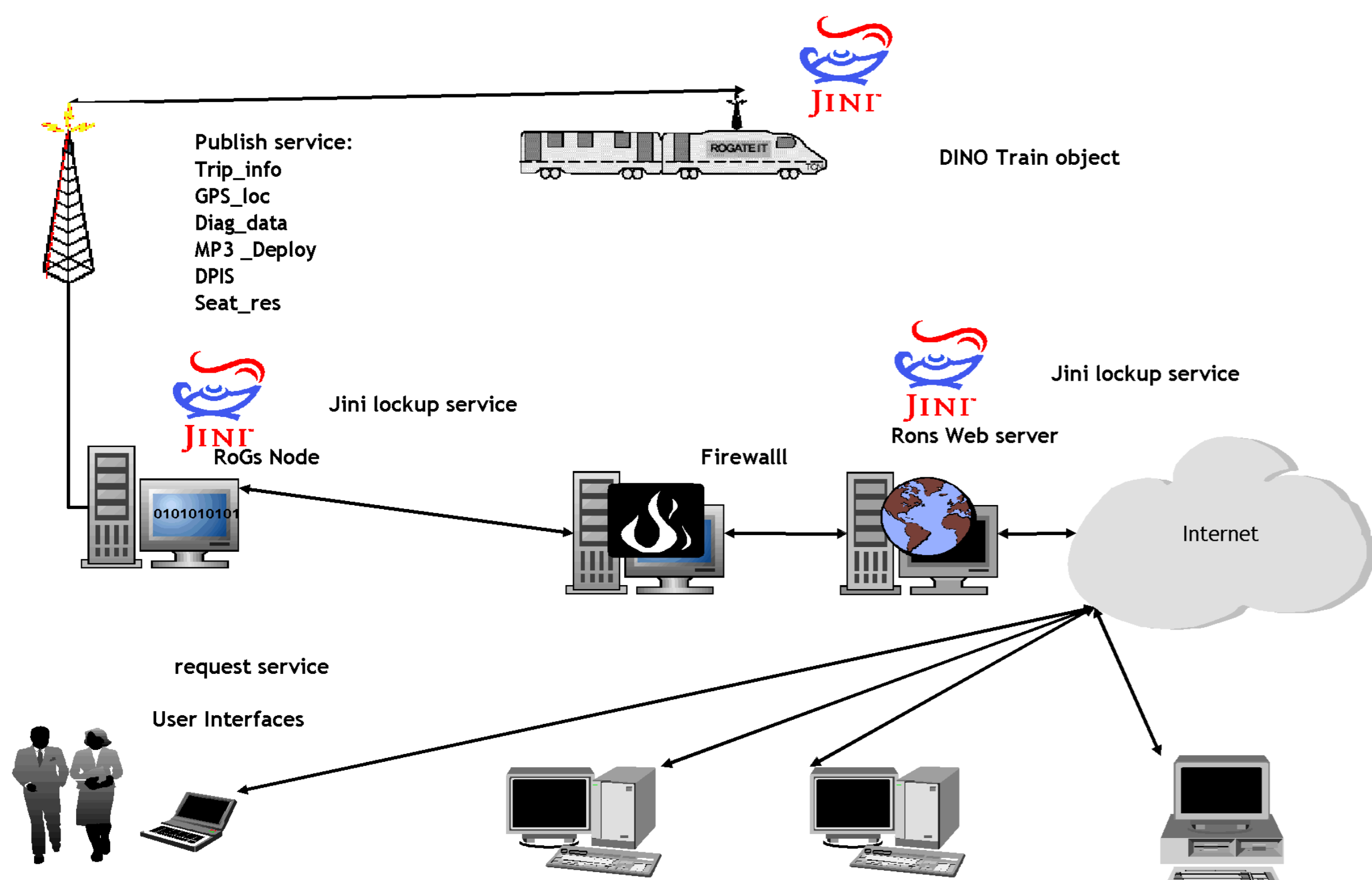




DINO - Dynamic Insertion Network Object

DINO is an open platform to implement and deploy services for Railway Operators and Citizens

Andrea Gatti - Trenitalia s.p.a. Unità Tecnologie Materiale Rotabile - Viale S. Lavagnini 58 - 50129 Firenze - Italy
e-mail: an.gatti@trenitalia.it



THE DYNAMIC OF THE TRAINS

One of the most challenging characteristics of networks in trains are the dynamics in the networks during coupling/decoupling, etc.

We have to distinguish different types of dynamics and different modes of access to a train:

- Train composition changes as run start/end, vehicles coupling/decoupling, add/removal of devices during power up/down;
- functional changes as spare train takes over, change of used/unused driver's cab and redundant device takes over.

- direct access to a specific consist/vehicle regardless where it is.
- access to a specific Running Train, regardless which consists build it. It means the consist is declared ready to scheduled service and linked to a "Running Train ID".

The setting up of a group of vehicles in a depot or in a maintenance facility needs to be traced by the network. Train coupling / decoupling is widely used and has to be supported by dynamic addressing schemes. To meet these requirements we need to have access to:

- each vehicle identified by its "Direct Car Identifier" (DCID);
- a group of vehicles (Consist) with its "Consist Identifier" (CID);
- and the scheduled train, the commercial services, using a "Running Train Identifier"(RTID).

THE TRAIN AS MOBILE CLUSTER OF SERVICES

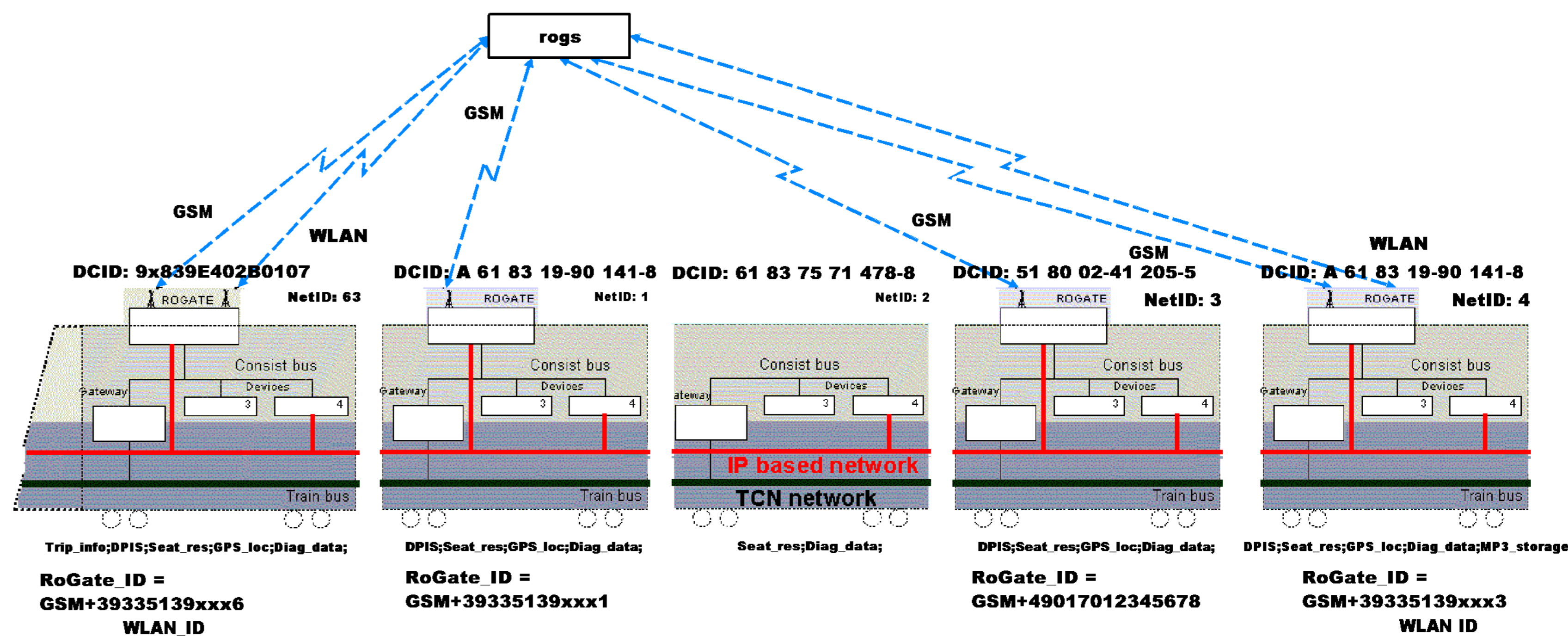
The train is a cluster of devices connected by a network; the devices are mapped in order to perform a set of functions or services. Each performed service needs a "Service Leader" at train/consist level and it is possible to map each service to a communication channel according to bandwidth's requirement. The RoGate is connected to the ground section using a set of wireless connection and will be capable to switch between them "on the fly" according to the bandwidth's requirement of the service.

The root service of DINO is the Train registration, as we need the access to the consist using the DCID or CID.

Without it is not possible to perform the other services. The RTID shall be assigned, for example, either to exchange DPIS and seat reservation information or to monitor the quality of service in terms of comfort.

A DINO train can provide a set of services like Seat Reservation, GPS Localisation, Diagnostic Data for maintenance, Storage of audio files for information and entertainment, etc.

The "Function Leaders" on the consist's network need to map the relationship between a specific Services and the "Service Leader RoGate".



The use of Jini

Jini technology is useful in developing a prototype distributed system to simulate services based communication.

Jini supports serendipitous interactions among services and users of those services. Jini also supports redundant infrastructure to reduce the probability that services will be unavailable if machines within the Jini community crash.

The clustering devices use a shared JVM available on the network.

From this point of view, a proxy for the JVM used by the various service devices would exist on the network. Service devices are added to the network, discover the existence of such a proxy device and register with that proxy.

Such a registration optionally includes the code written in Java programming language needed by a client of the device (either directly or as a URL to be used to obtain the code) and code needed by the proxy to communicate with the service device.

Ground side, services and multiple RoGs

In developing the prototype we use a single ground station, but in modelling the system it is not correct to consider a single RoGs.

Open trains and cross border connections are the reference's scenario, so the real environment will present several RoGs.

