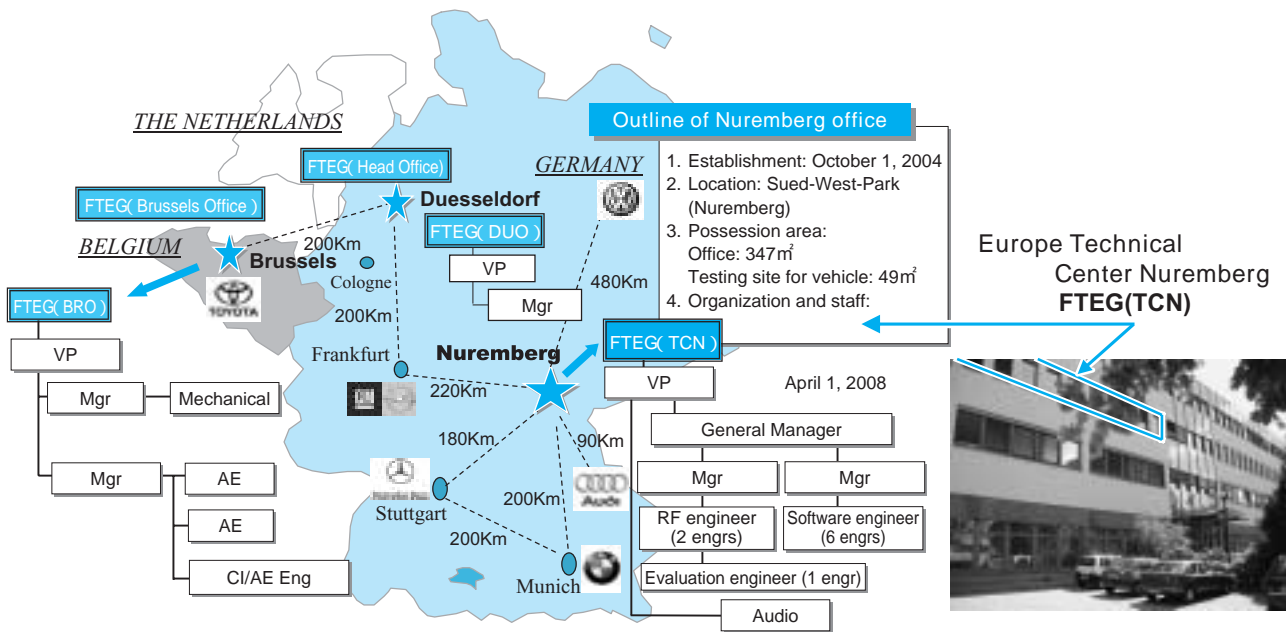


Introduction of Our Europe Technical Center Nuremberg (TCN)

Fujitsu Ten (Europe) GmbH Technical Center Nuremberg

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Abstract

FUJITSU TEN Europe Technical Center Nuremberg (hereinafter, referred to as TCN) was established in October 2004 in Nuremberg, Germany. Currently, we have nine engineers, comprised of six software engineers, two hardware (radio technology) engineers, and one evaluation engineer. In Europe, the specific reception technology (RDS, DAB, DVB-T, etc.), is different than in Japan and North America. Know how of that technology greatly affects the success of negotiations about business and customer complaints. Also, among the many other countries in Europe, the reception conditions vary from country to country as well as language and preferences. Thus, in such a severe environment, developing products in Japan as we used to do will not compete with the powerful European manufacturers such as Blaupunkt or H. Becker. Consequently, in TCN, we gathered many enormously-capable engineers with wide experience in automotive reception technology to catch up with and overtake our competitors in a short period. Here we introduce TCN operation results including the radio technology that we have developed the cooperation with TomTom, and others.

1 Introduction of Nuremberg

Nuremberg, in which TCN was established, is located slightly south of the center of Germany, and is one of the most important areas of high-tech industry in Europe. In Nuremberg, there are companies relating to information technology (IT), traffic, medical care and energy, and large-scale international trade shows are held every year. Nuremberg has a population of about 500,000, and it is within a large economic zone including peripheral cities, which has a population of about 2,500,000. In Japan, Nuremberg is known for Nuremberg trials and its Christmas Market.

2 Background Why "RDS" has been selected as First Technology Development

RDS (Radio Data System)

RDS means a radio data broadcast system where the broadcast station provides various data (identifying signal, program contents, traffic information, etc.).

The radio automatically switches (Network Follow) to the best receivable station with same content and indicates the traffic information using the RDS data. This RDS Network Follow (hereinafter referred to as N/F) makes it possible to receive the same FM broadcast contents for a long time with good quality even while driving long distance in a country. As for this N/F technology, it is important to switch quickly and properly (without mistake) with no audible distortion, using detectors for field strength and quality information (multipath, adjacent interference, etc.) and know-how of each company. There are many stations broadcasted in FM. They are allocated by 100 kHz step in Europe (200 kHz step in Japan and U.S.) Thus the reception performance against adjacent interference is important. Also, the station of another country may be received at the same frequency around country borders because many countries are adjacent to each other, and hence it is very difficult to design the radio.

How RDS is Developed

In 2004, the year in which TCN started operation, Fujitsu Ten won the order for OEM business providing to company S, an European manufacturer.

For FUJITSU TEN (Europe) GmbH (hereinafter, referred to as FTEG), which is a subsidiary of FUJITSU TEN LIMITED, this was the first big OEM business beside TOYOTA MOTOR CORPORATION Europe (hereinafter, referred to as TME).

The first task of TCN was to participate in the technical review, join field test of radio, and discuss other matters with company S.

The evaluation of reception performance for company S is conducted by the electrical engineering department in Germany, which is a parent company of company S. Unless they give approval, we cannot obtain an approval for mass production.

The German electrical engineering department has a long business relationship with local manufacturers in Germany, which are said to have the best RDS technology in Europe. The German electrical engineering department is known for having an extensive knowledge of RDS and is very well known for making strict demands related to RDS and reception performance, to manufacturers.

German electrical engineering department first conducts an evaluation of RDS on the test course in the mountains located near their head office (Germany). This course is a gateway to success of RDS evaluation, and the first hurdle. The radio wave environment of this course is extremely severe with stations having very little field-strength compared to other RDS test courses in Europe, on which FUJITSU TEN LIMITED had conducted evaluations so far. Even in this environment, proper function of RDS Network is required.

At first, when our radio for company S was evaluated, its RDS Network did not work in the steepest valley in this course, and that's why the radio was not approved. A radio that worked properly with RDS Network in this point was the radio of a local manufacturer in Germany. At that time, TCN had just been established and it did not have the technology to immediately meet the requirements of the German electrical engineering department. However we were able to obtain the approval for mass production, provided that TCN develop RDS technology to meet the requirements of the German electrical engineering department and incorporated the RDS software into the products of company S for mass production. TCN started the RDS development with a goal of achieving the same level as a product of above-mentioned local manufacturer equipped with 1Tuner RDS that was provided from German electrical engineering department as a reference product.

As mentioned previously, TCN was able to hire experienced engineers on development of automotive radios (hardware and software), so all engineers were engaged in RDS development, thoroughly deciphering the RDS specifications provided from German electrical engineering department. For RDS development, we first developed various tools. One of them, Network Following Tool (Fig. 1) is an excellent tool that visualizes the RDS behavior, and this tool allows us to analyse RDS behavior correctly. Also, we developed a tool that records various

parameters during test drive to PC and accurately reproduces them on a bench. This tool was useful during RDS development.

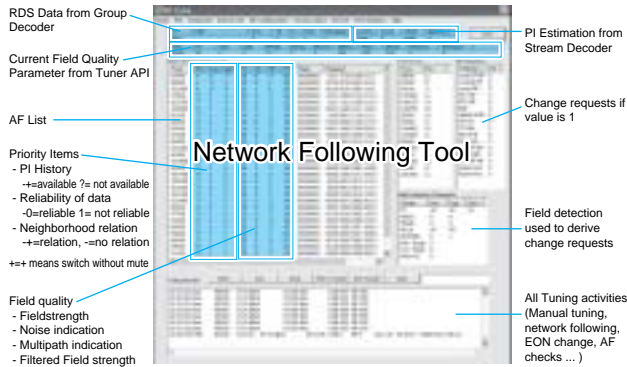


Fig.1 RDS Trace Tool

Due to many demands for improvement from the German electrical engineering department, TCN took more than one year to develop the RDS, and as a result, TCN finally gained the approval of German electrical engineering department in 2006. At that time, a person, who had been a liaison officer of German electrical engineering department and been responsible for the evaluation of RDS development of Fujitsu Ten for two years, said that Fujitsu Ten had progressed to a level which matched with the European competitors. TCN obtained a patent of this RDS technology.

Also, the RDS developed by TCN was adopted in the audio for TME and adopted in the navigation for an GM, and it became a standard RDS of FUJITSU TEN LIMITED.

3 Cooperation with Tom Tom in Europe

When TCN was first established, in the European car navigation market, the high-end model was full navigation and low-end model was an arrow-indicated navigation (Turn by Turn navigation).

However, in 2003, Tom Tom, which is based in England, released Tom Tom Navigation2, which is portable navigation device (hereinafter referred to as PND), and it became a huge hit. After that, the PND started to spread rapidly, replacing the Turn by Turn navigation that had been main stream. In 2007, the PND market amounted to nearly 20 million units, and now Tom Tom holds a share of 50% or more in the market.

In 2004, TCN conducted a benchmark survey of Tom Tom as requested by FUJITSU TEN Kobe. At that time, we held a meeting with the chief executive in the development of Tom Tom, and this meeting created business chances of cooperation. Then we were able to reach an

agreement that we promoted the development of Supercat (Fig. 2). The Supercat is a new concept product that combined car audio and PND that TCN and FUJITSU TEN Kobe invented together.



Fig.2 Supercat

TCN's roles included project management of cooperative development, development support of Europe specific technology such as RDS, TMC, GPS, etc., evaluation of local compatibility, and related matters.

The most difficult thing was how to promote the cooperative business between Tom Tom, which is a consumer manufacturer, and Fujitsu Ten, which is an automotive manufacturer, having different cultures respectively. We also had difficulties that there were differences in attitudes toward the start of production and quality, and thus we promoted cooperative business with the cooperation of FUJITSU TEN Kobe.

During the development, we first faced a problem that GPS signal received from an external cable is transmitted via flexible printed board to PND side on the front face of Supercat. In general, the coaxial cable is used; however flexible printed board must be used to solve the structural problem because of tilt feature. A RF engineer in TCN, who is good at technology that is related to this problem, solved this problem by designing the pattern to reduce the loss of GPS signal using computer simulation.

This RDS software was developed by a software subcontractor of Fujitsu Ten Kobe because it is combined with another audio control section. Based on the knowledge and know-how gained during the development of RDS for company S mentioned previously, we compiled the required specifications and provided them to the subcontractor. TCN was in charge of the local field test of the RDS, and asked the subcontractor to incorporate the improvements into the RDS, obtaining cooperation of Fujitsu Ten Kobe. As a result, European commercial distributors and TME admires us for our RDS performance of Supercat.

As for Supercat, members of FTEG and TCN participated from the beginning of the product planning phase to product launch in Europe. With the effort of the FTEG sales and marketing team we could obtain optional businesses at TME and its delivery has already started.

4 Future Development Roadmap

FUJITSU TEN Europe was behind in establishing its own Technical Center as compared with other Japanese competitors and there are many Europe-specific technologies other than RDS that we have to develop in a hurry.

One of them, DAB can be given as an example. More than 10 years have passed since FUJITSU TEN LIMITED first developed a prototype of DAB receiver. However DAB is still not well accepted in the market. In Europe, FM analog broadcasting is going to be terminated and shifted to digital broadcasting (DAB) by 2015; therefore we need to make a fresh start for DAB. Fortunately, TCN has many experienced engineers of DAB development and DAB also requires the network technology of RDS, so we believe we can develop excellent DAB technology.

All brand names and product names are trademarks or registered trademarks of their respective companies.

Profiles of Writers



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Entered FUJITSU LIMITED in 1979. Since then, had engaged in the development of OEM products at FUJITSU TEN LIMITED. After that served as Vice President of FTCP. Currently is Head of Technical Center Nuremberg and Vice president of FTEG.