Living Linux in Critical Environments

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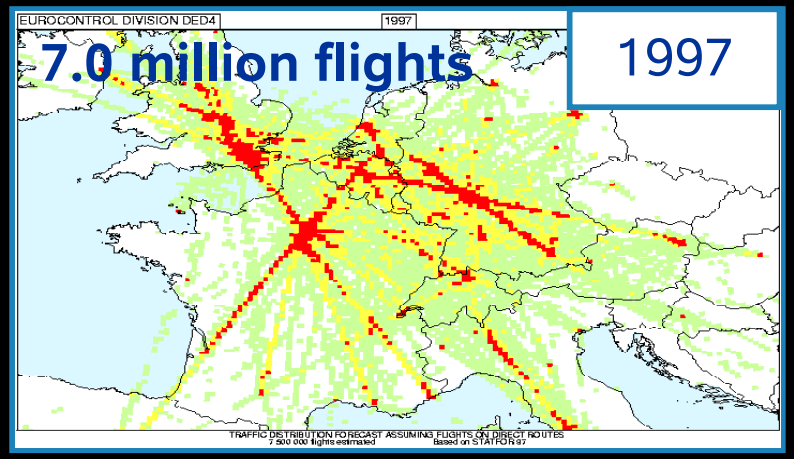
Warning

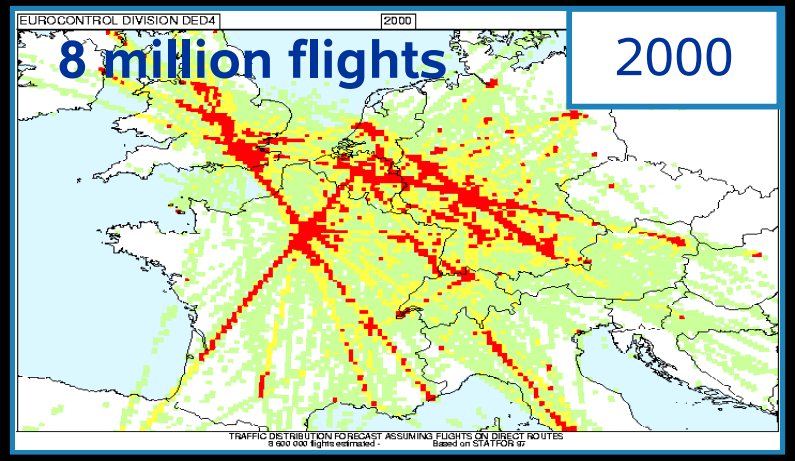
This presentation has been modified from its original version. It has been formatted to fit your screen. It has been edited for content and to run in the allotted time.

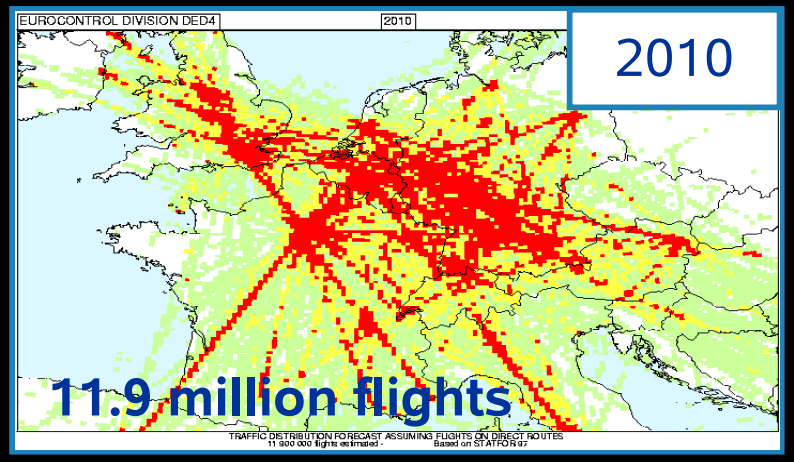
PG	**Parental Guidance Suggested**
	Some material may not be suitable for children

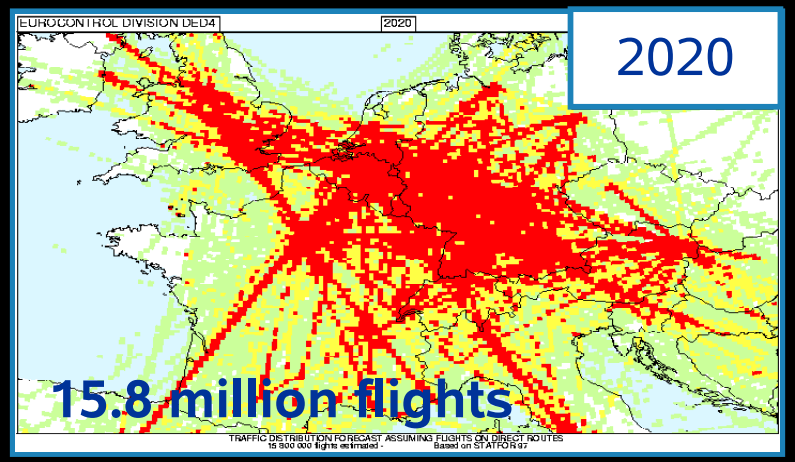
The German Aviation Act states that "the air navigation services shall ensure the safe, orderly and expeditious handling of air traffic".

Air Traffic Growth in Europe

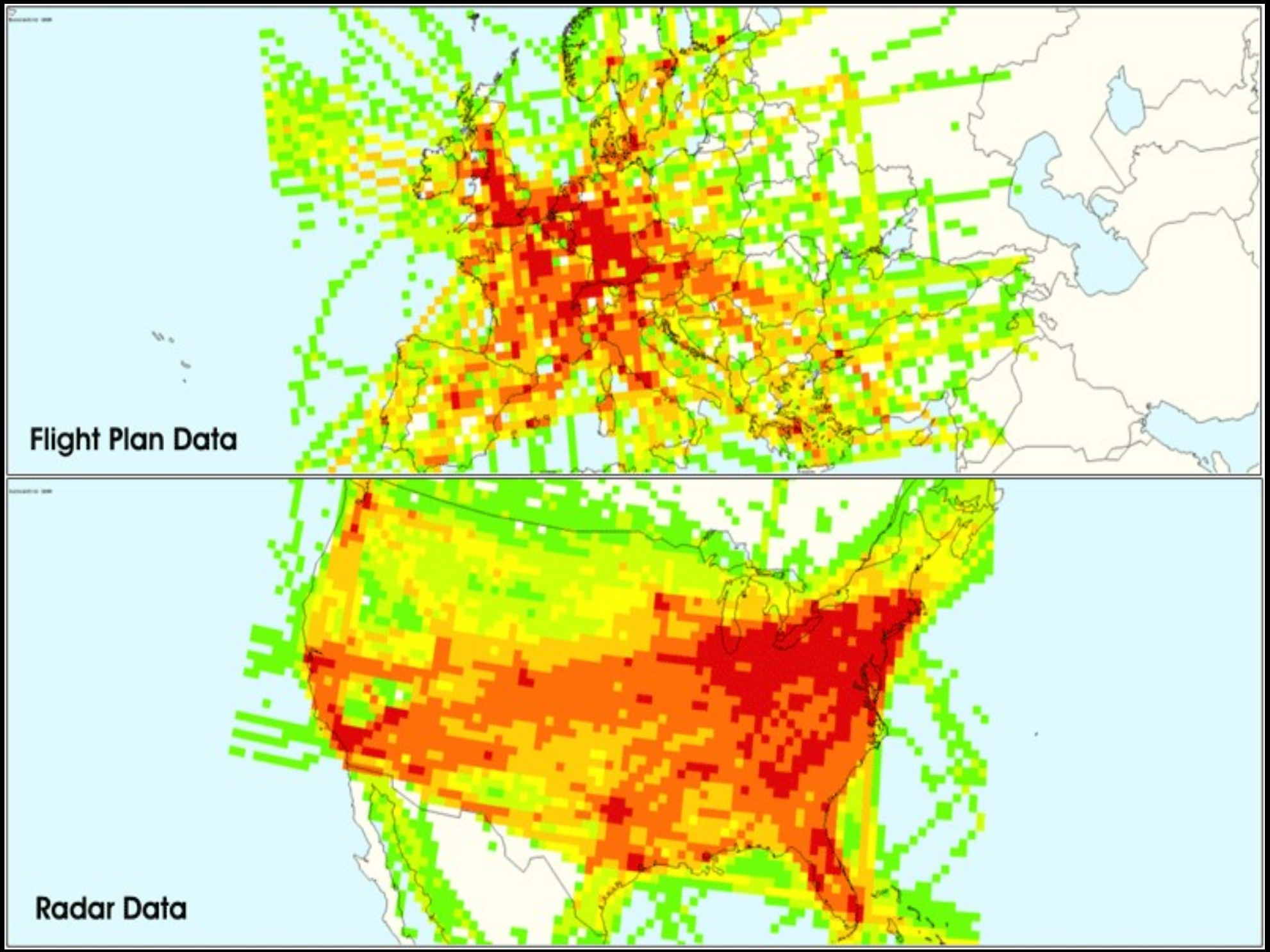




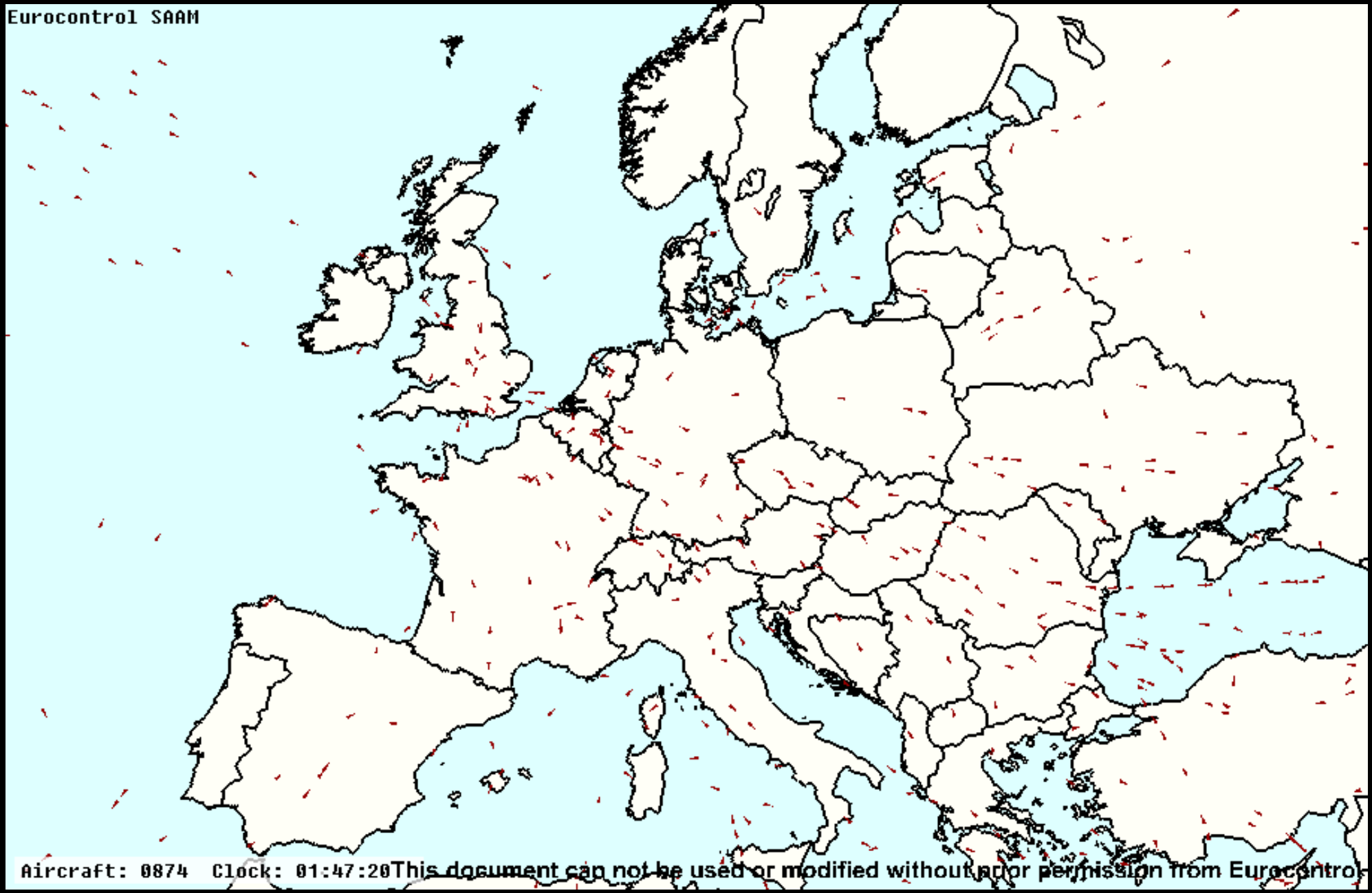




Flights p.h. 150 and more
Flights p.h. 100 to 150
Flights p.h. 50 to 100


Flight Plan Data
Radar Data

A Typical Day in Europe



The Linux Competence and Service Center

Linux Product Management for operational ATC-Systems

Operation of a central test center

LCSC – Linux Competence and Service Center

Documentation

Defining security standards

Training

Software modifications and adaptations

Consulting

Determining the DFS Linux basis

Testing and quality management

Why Does DFS Use OSS Software?

European air traffic control regulations

German Aviation Act

ESARR6, ED-109

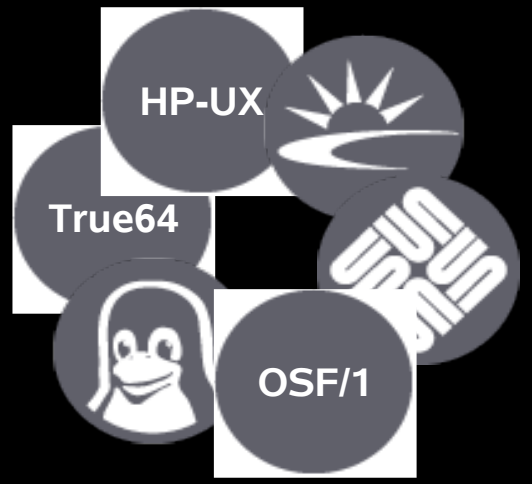
Federal Supervisory Authority for Air Navigation Services

Manual of Operations for Engineering

DFS regulations

System availability > 99.9%

Background



- Application of various UNIX derivatives
  - System life cycle >10 years
  - 99% safety-critical applications
    - Flight plan data processing, radar data processing
  - Parts of the support agreement with OS manufacturer had already been cancelled
  - Update of OS would have involved a high workload
  - System hardware could no longer be supplied
  - Sources of applications were no longer available

Aims of Linux / OSS Strategy

- Cost reduction
  - Use of PC hardware (x86)
  - Uniform operating system "Linux"
  - Use of development standards (LSB, POSIX)
  - Applications easy to port
  - Harmonization of system management
- Own software development
  - Development of own radar data processing systems
  - Marketing of software and systems
  - Development of OSS software (STANLY_MVPA)

Implementation

Development of our own radar data processing system

Purchase of source codes for old systems

Establishment of Linux Competence and Service Center

Selection of SLES/RHEL as the basic platform

Porting of applications / systems to the new platform

Status of Development

- Over 1500 operational systems run on Linux
- PHOENIX, the radar data processing system developed by DFS, is used in operations at all Towers in Germany
- PHOENIX has replaced the proprietary fallback systems in the control centers
- PHOENIX is being marketed around the world
- The Linux Competence and Service Center is the main point of contact for the Linux operating system

Future Developments

- Migration of current primary ATC System to Linux
- Development of new ATC Systems on Linux only

Results

- Linux is not for free
- But OSS / Linux does offer certain freedoms:
  - Not tied to the life cycles set out by manufacturers
  - Choice of different Linux flavours
  - Easier to exchange hardware
  - Excellent support from developers community and manufacturers
  - Bugs can be corrected by in-house staff
  - Scalable, stable and high-performance operating system

Results

- Reduction in costs thanks to use of PC hardware
- No deterioration in system stability
- Benefits of the central LCSC:
  - Cost savings as no need for consultancy services
  - Know-how is acquired within the company
  - The right decisions are made when selecting products thanks to the in-house know-how
  - Shortening of project terms as tasks are delegated to the Linux Competence Center

Lessons Learned

- With the appropriate skills and planning Linux is stable enough to be used in ATC
- Contrary to commonly accepted principles, if a IT organization is willing to make the investment in in-house expertise, it can actually diminish instances of problem resolution wait states from vendors.
- Learn to rely on your own resources, both internally and within the Linux community by adjusting to the differences in culture and process of an open development community.