# Concepts of Plasma Data Analysis
# and
# Equipment Coupling

**Dirk Suchland**
**ASI Advanced Semiconductor Instruments GmbH**
**Rudower Chaussee 30**
**12489 Berlin**

# Motivation of Equipment Coupling

- link logistical data (LotID, ToolID, Step, etc.) to sensor data
- unification of data streams of the tool and the sensor

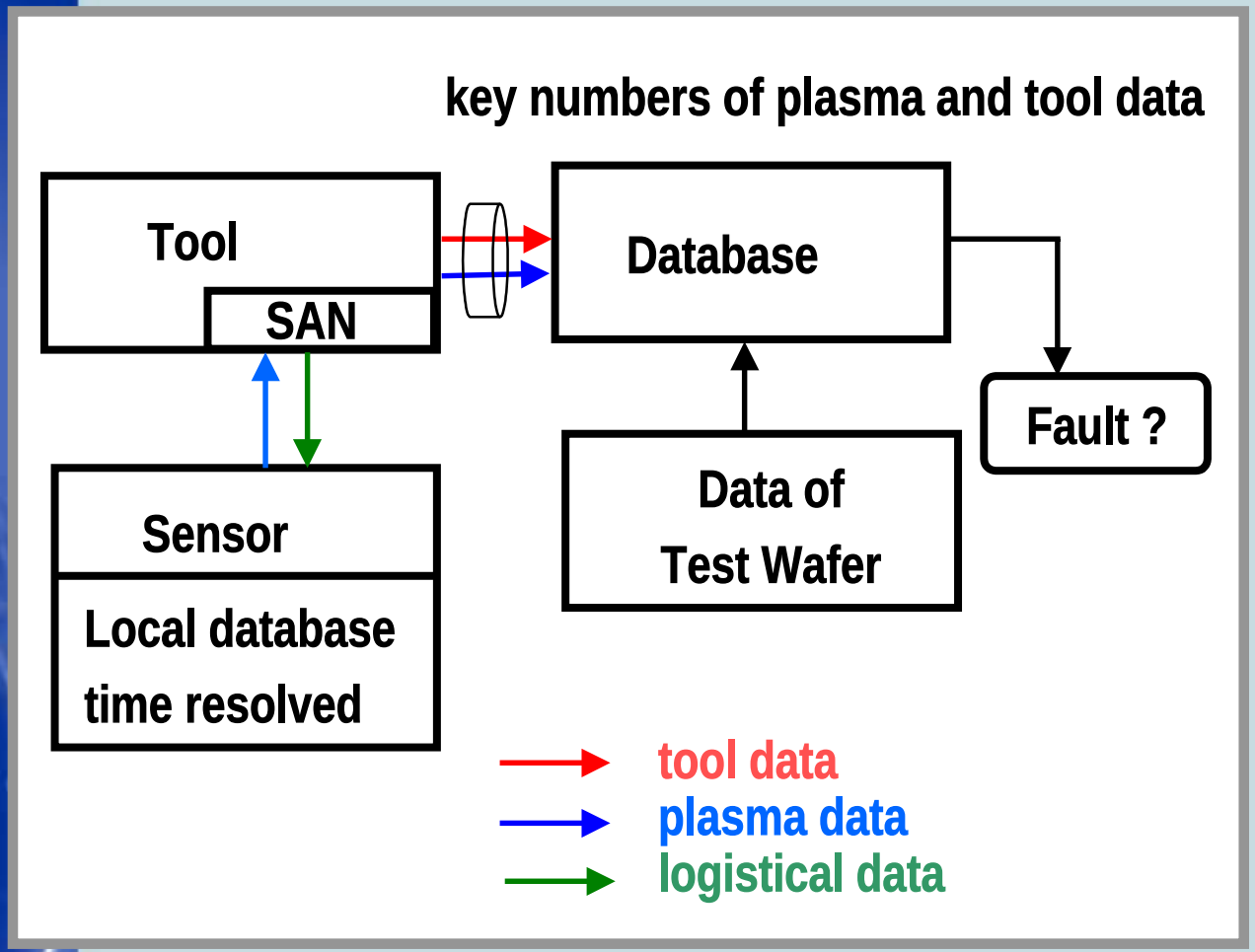
sensor is coupled with the tool

**Fault detection and APC possible**

**Equipment Coupling**
- the basic requirement for APC and fault detection

**Add-On-Sensor**
- necessary to get process relevant data

# The Aim of Equipment Coupling




SAN integrated in the tool

unification of data streams in the tool

only key numbers of relevant data are stored

→ data compression!

in case of detected fault - time resolved data for deeper analysis

ADVANTAGE: plasma data integrated in the tool data

SAN: Sensor-Actuator-Network

# Equipment Coupling Concepts of Hercules

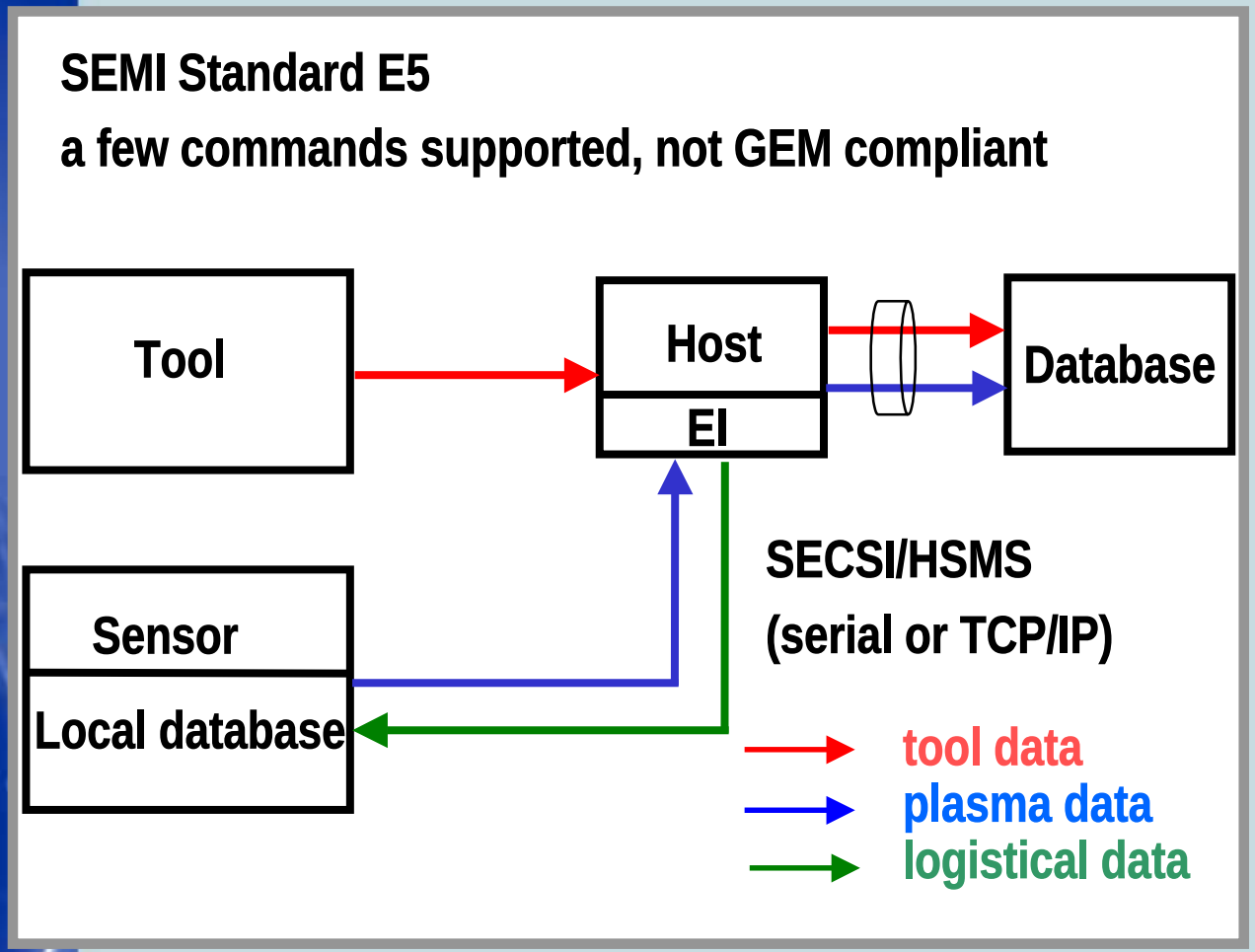
1. SECS
2. Brookside´s Hercules option
3. TICS (Infineon-Standard) one way connection, only logistical data
4. LAM - pnp - Sensor Interface
5. Silverbox
6. Data transfer using analog interface
7. *S*ensor-*A*ctuator-*N*etwork: Modbus

SEMI-Standard E54

- Modbus/TCP is one of 5 possible network communication standards
- SAN is not yet implemented in the etch-tools → has not found wide application yet

SAN: Sensor-Actuator-Network

# SECS II

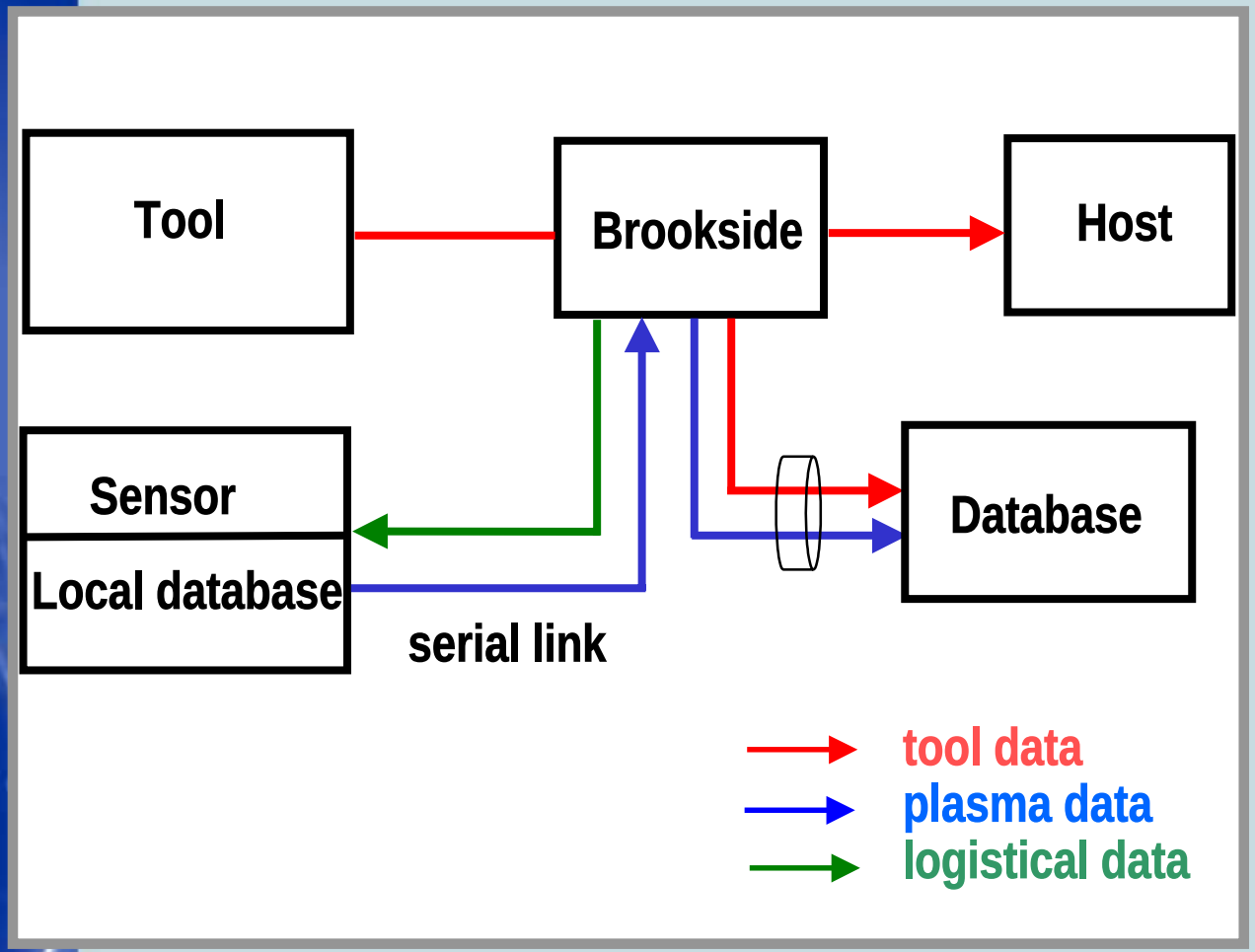



- for each sensor one Equipment Interface (EI)
- transfer of sensor data by data tracing

**PROBLEMS:**

- data unification
- step information delayed
- time synchronisation of tool and sensor to reduce delay

# Brookside´s Hercules Option




data exchange via Brookside´s „Hercules interface“

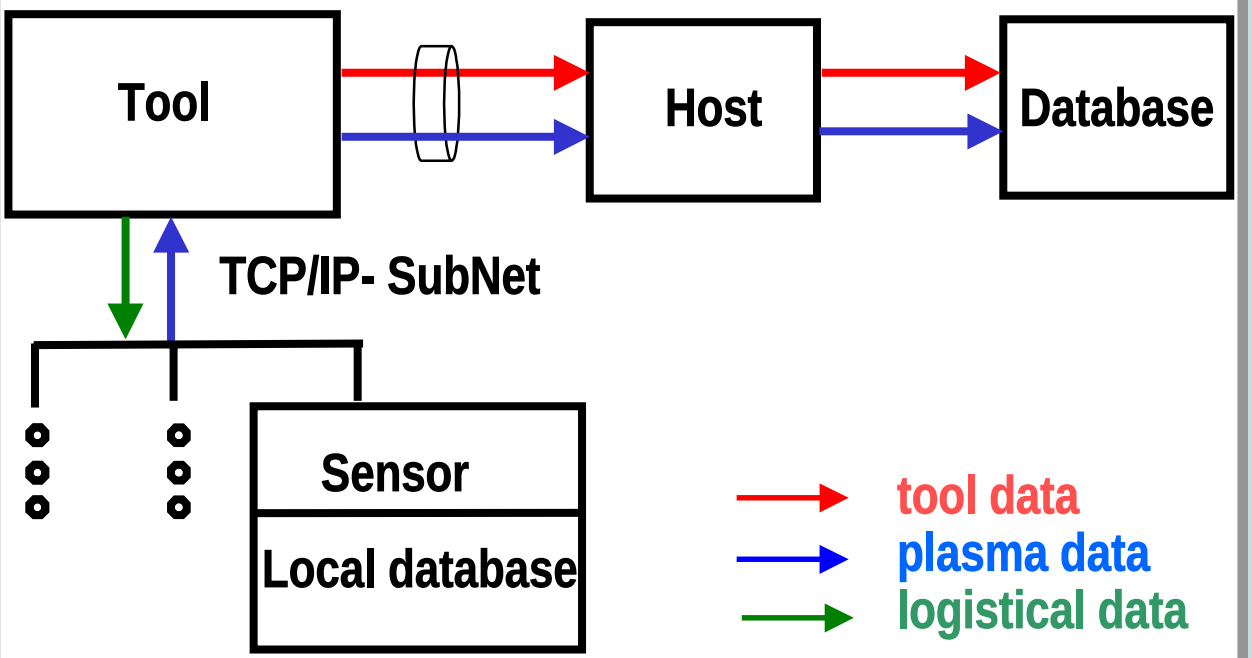
- step information included
- Brookside contains all tool data and plasma data

ADVANTAGE: fast and easy implementation

# LAM - PnP Sensor Interface

**Plug and play Sensor Interface**

**First implementation of a sensor interface into a tool**

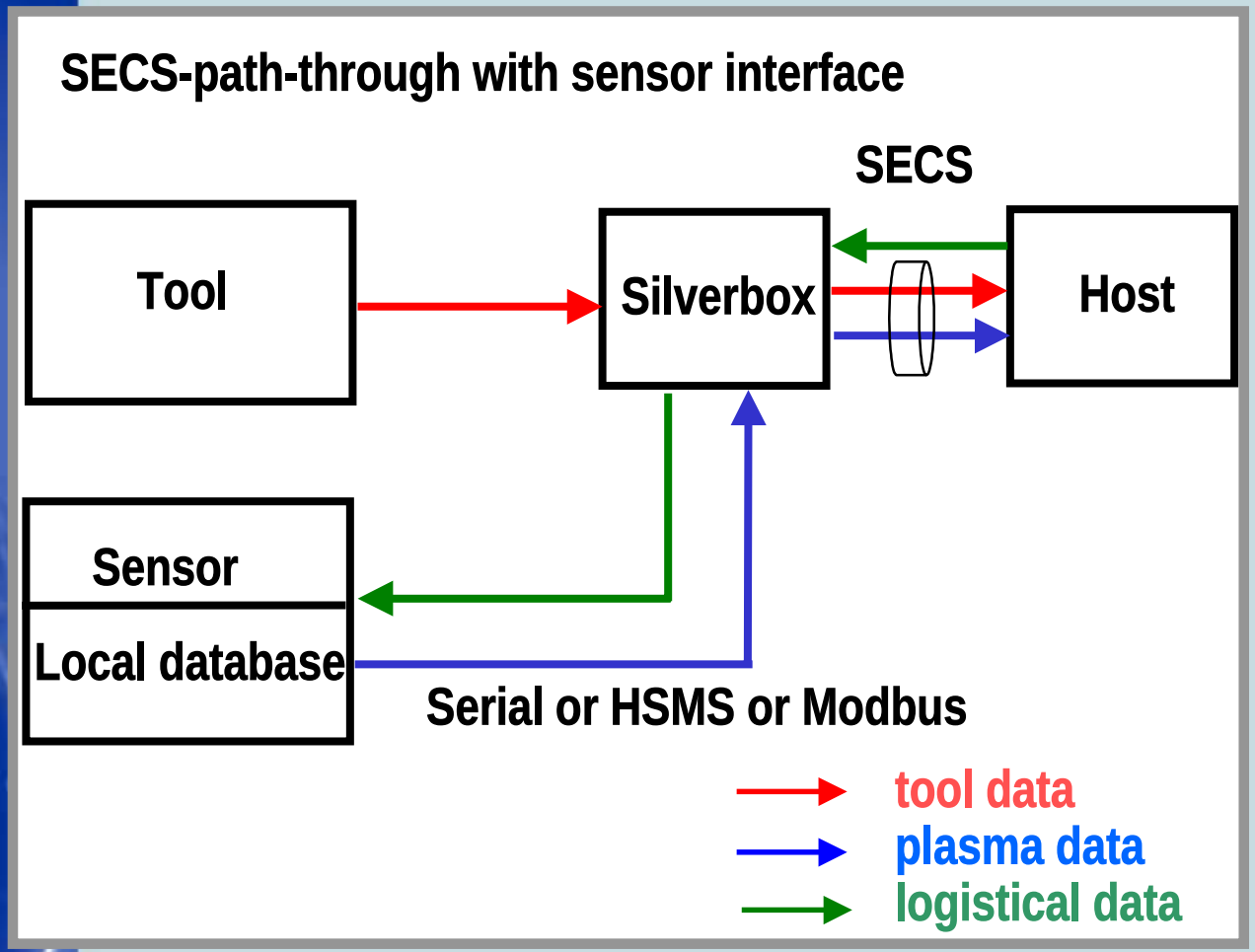



similar to the SAN

best available solution for sensor integration

all data are unified in the tool

# Silverbox or other



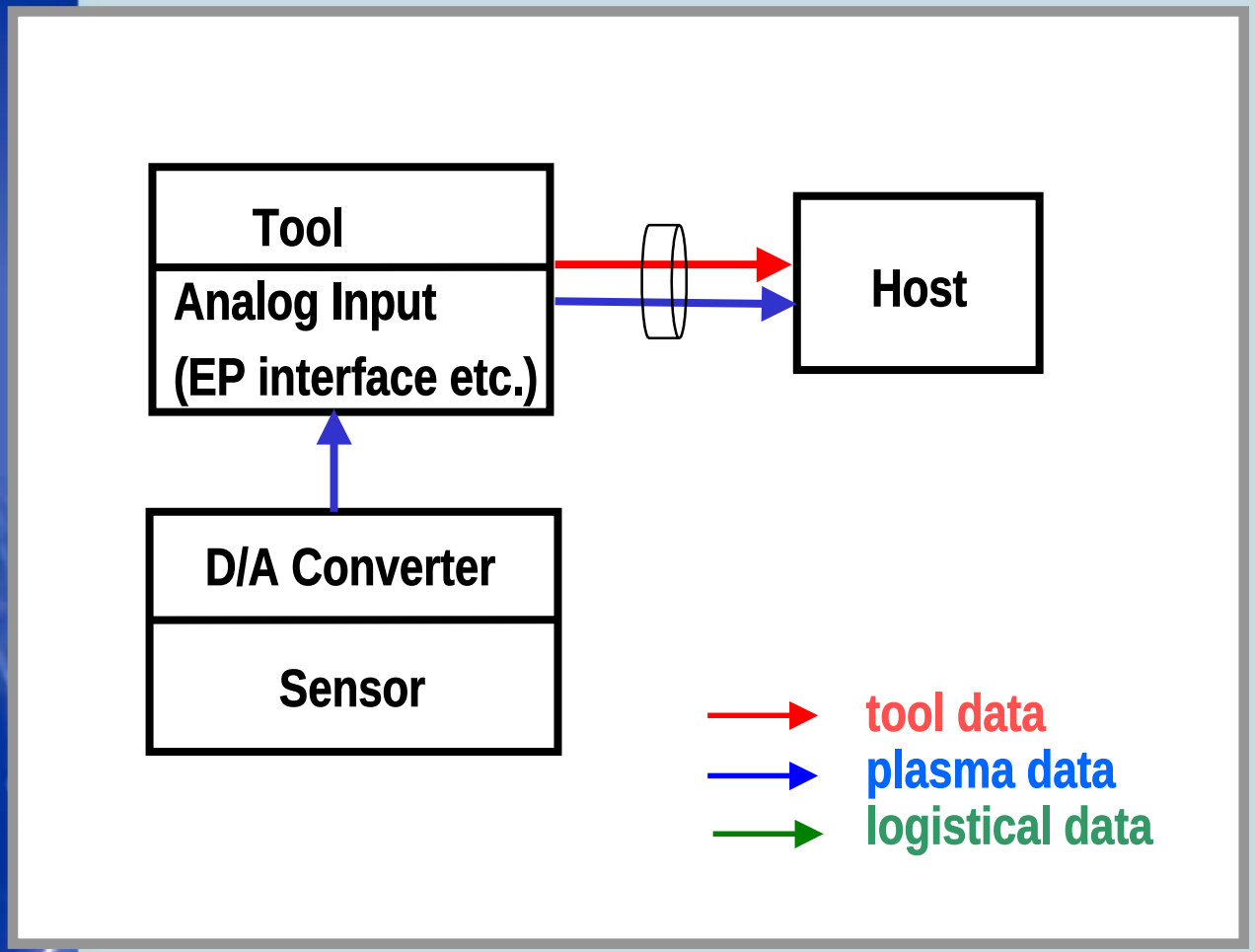

„SECS-relay“ with integrated sensor interface

pre-filtering of the data possible

supports more than one sensor

easy implementation

# Analog Data Interface




data unification in the tool

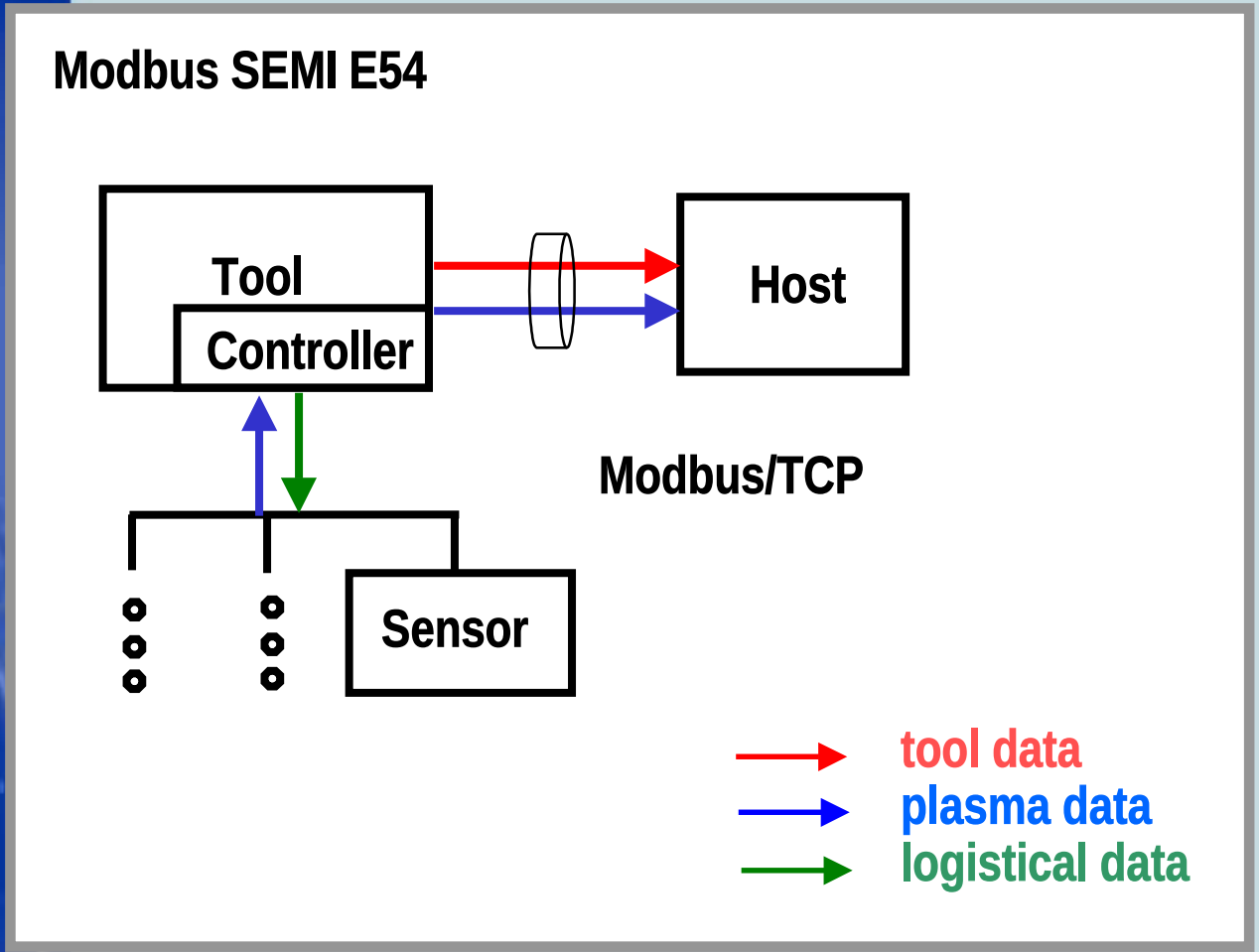
tracing of plasma data via SECS-Interface of the tool possible

quick and easy implementation

**DISADVANTAGE:**

- restricted resolution
- data range is limited

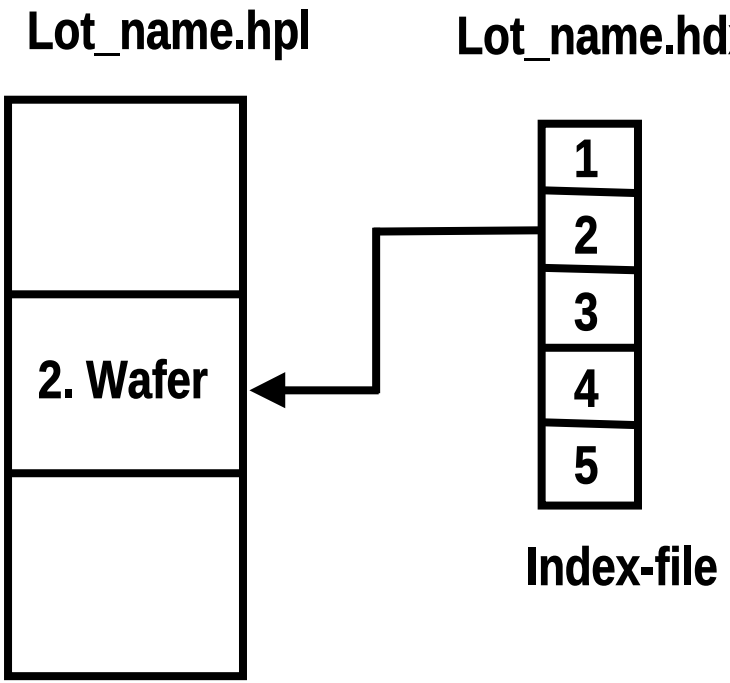
# SAN (Modbus)




Common Network Communication Standard (NCS): TCP

- more than one sensor
- Plug and Play
- link to tool data including logistical information
- data unification in the tool
- Will be Modbus the solution of the future?

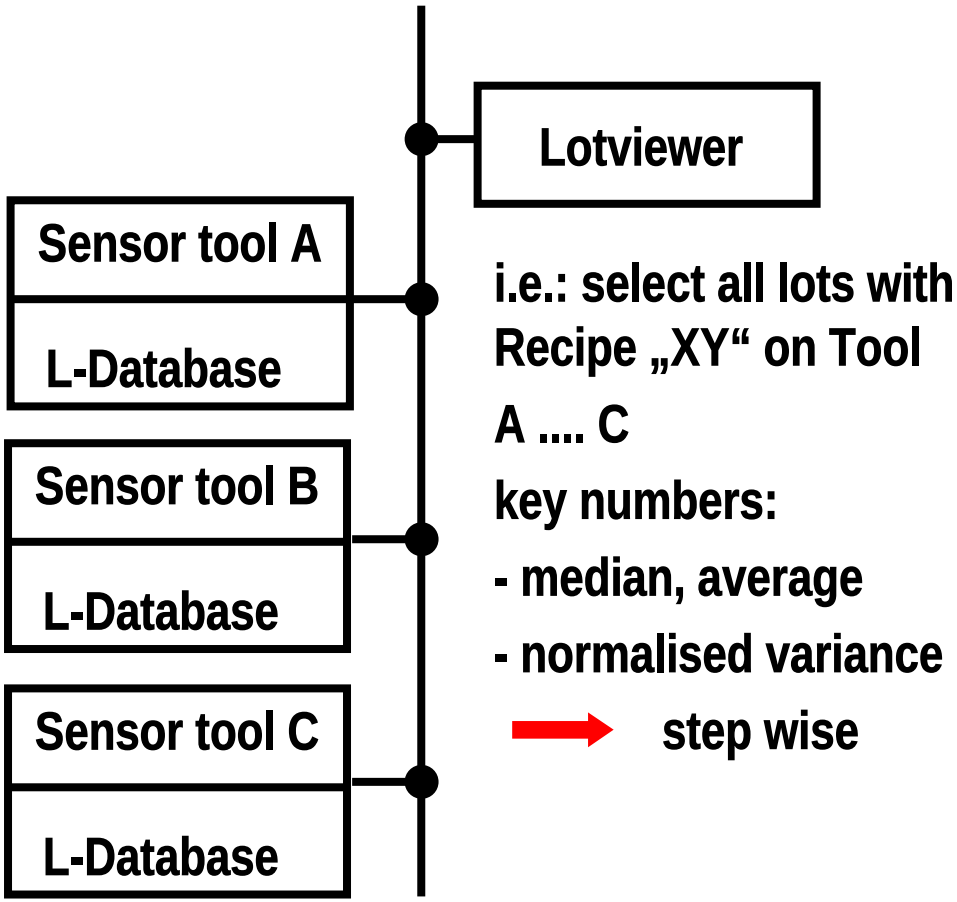
# Local Data Base of Hercules




Pointer based byte format:
- data compression (for time depended raw data, ASCII is not recommended)
- fast access
- easy unification of plasma data of different sources
- data selection by logistical data
- export to ASCII/Excel

Local solution is important for:
- backup
- deep analysis in case of faults
- time resolved data

# Lot Viewer




- fast access to plasma data
- trend analysis on the basis of statistical quantities
- key numbers for each wafer
- select wafer by WaferID within a lot → wafer tracking possible

Export → ASCII

selection criteria:
LotID
RecipeID
ToolID
Chamber
Recipe Step

# Comparison of Data Coupling

| | Logistical Data | Step Information | Plasma Data Transfer | Recommended |
|---|---|---|---|---|
| SECS | x | x*) | x | (x) |
| Brookside | x | x | x | x |
| TICS | x | x*) | | |
| LAM-PnP | x | x | x | x |
| Silverbox | x | x | x | x |
| Analog Interface | | | x | |
| Modbus | x | x | x | x |

*) temporal delay