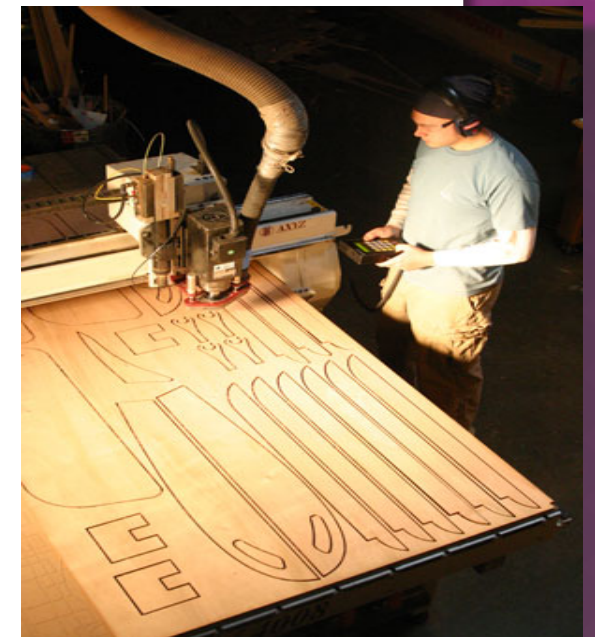# OUTLINE OF PRESENTATION :-

1. Introduction to NC lathe machine.
2. Introduction to CNC lathe machine.
3. Introduction to DNC lathe machine.
4. Difference Between NC, CNC and DNC lathe machine.

NUMERICAL CONTROL (NC) DEFINED

- **NC (numerical control) lathe** are the lathe machine, of which the various functions are controlled by : *letters , numbers and symbols*.

- The NC lathe machine runs on a program fed to it; without human operator. The NC program consist of a set of instruction or statement for controlling the motion of the drives of the lathe machine as well as the motion of the cutting tool.

- **NC lathe machine , one or more of the following function may be automatic :**

i. Starting and stopping of the lathe machine spindle;
ii. Controlling the spindle speed;
iii. Positioning the tool at the desired location and guiding it along the desired path by automatic control of the motion of slides;
v. Controlling the feed rate; and
v. Changing the tools.

CNC Laser Cutting Machine, Capacity upto 28 mm Thickness.

COMPONENTS OF NC LATHE MACHINE SYSTEM

1. **Part program:-**

- Using the part drawing and the cutting parameters, the part program is written.

- The part program is a set of step by instruction to the lathe machine for carrying out the operation.

Method use for part programming

1. Manual part programming
2. Computer-aided part programming

2. Program Tape:-

◉ The part program is entered on the program tape.

◉ The program is entered on the tape in the form of punched holes. The holes are punched with the help of punching machine.

3. **Machine Control Unit(MCU):-**

◉ The program tape is read by the tape reader.

◉ The controller takes input from the tape reader.

4. **lathe machine:-**

◉ The lathe machine is operated by the controller of the machine control unit.

ADVANTAGES OF NC LATHE MACHINE

- Cycle time reduction
- Complex machining operation
- High degree of accuracy
- Less inspection required
- Reduction of scrap and wastage
- Increasing productivity
- Lower tooling cost
- Reduction of human error
- Greater operation safety
- Greater operation efficiency
- Reduction in space required
- Operator skill-level reduced

LIMITATION OF NC LATHE MACHINE

- High investment cost
- High maintenance effort
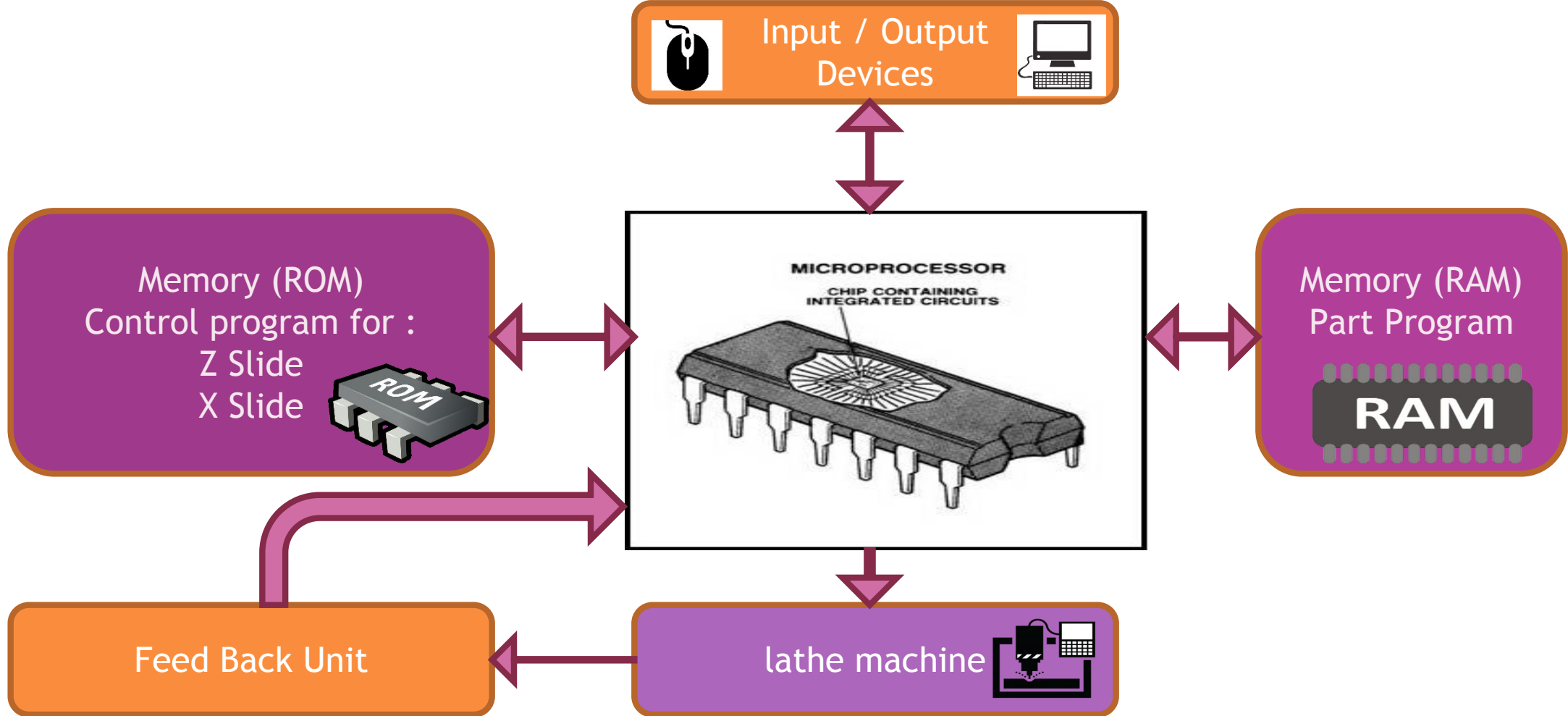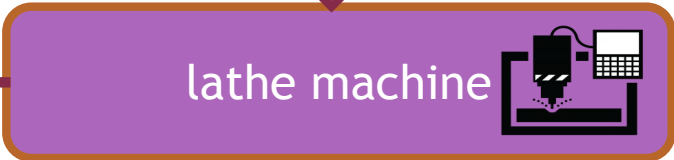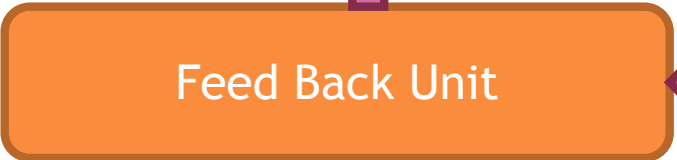- Need for skilled programmers
- High utilization required

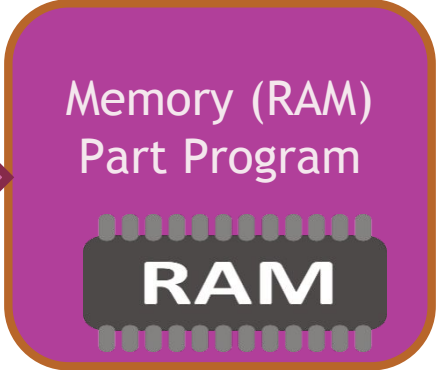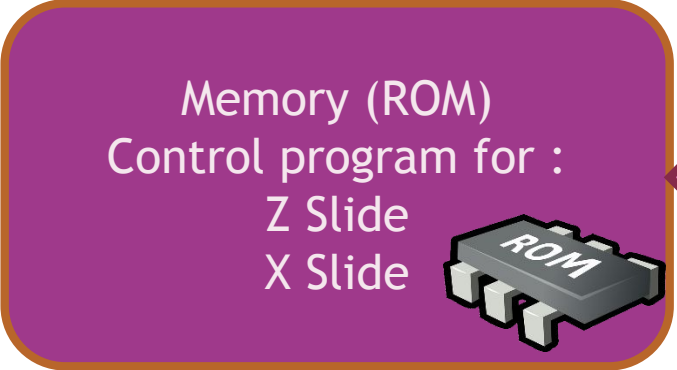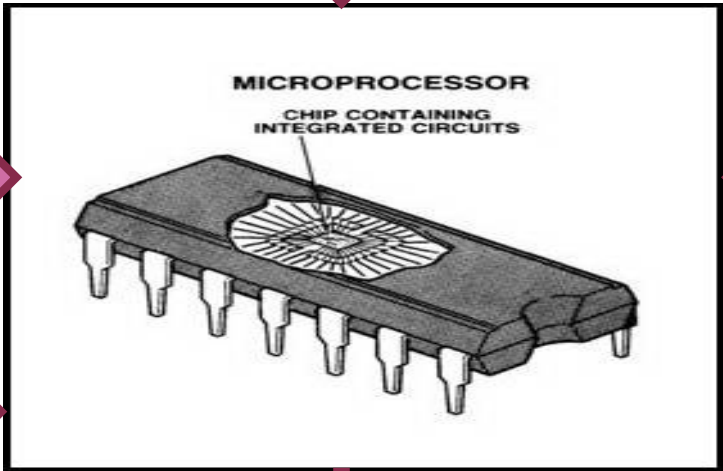- In **CNC (Computer Numerical Control) machines**, a dedicated computer is used to perform the most of basic NC machine functions.

- **CNC (Computer Numerical Control) machine** is a NC machine which uses a dedicated computer as the machine control unit.

- The entire program is entered and stored in computer memory. The machining cycle for each component is controlled by the program contained in the computer memory.

- The stored part program listing can be used for future production also.

- The main components of CNC lathe machine are as follows :

1. Input / Output Console.
2. Microprocessor Based control unit.
3. Memory.
4. Feedback unit.
5. lathe machine.
6. Interfaces.

- **Input / Output Console :** It is the unit through which part program is fed to the CNC lathe machine system and required output is taken out. It basically consists of monitor and Keyboard.

- **Microprocessor :** This controller takes input from Input / Output device, Feedback from feedback unit and actuates the drives as well as the tool of the lathe machine.

- **Memory :** It consists of RAM & ROM. The RAM stores part program, while ROM stores the programs for machine control.

- **Feedback unit :** The feedback unit takes input from lathe machine and transfers it to control unit for necessary corrections.

- **lathe machine :** lathe machine is operated by the control unit.

- **Interfaces :** They are the connections between the different components of the CNC lathe machine system.

(a) According to type of Feedback systems

1. Open loop type CNC machine.
2. Closed loop type CNC machine.

(b) According to type of tool motion control

1. Finite positioning control CNC machines.
2. Continuous path control CNC machines.

(c) According to program methods

1. Absolute Programming CNC machine systems.
2. Incremental Programming CNC machine systems.

(d) According to type of controller

1. Hybrid controller CNC systems.
2. Straight controller CNC systems.

(e) According to axis & type of operations

1. CNC horizontal machining centre.
2. CNC vertical machining centre.
3. CNC turning centre.
4. CNC milling centre.

ADVANTAGES & LIMITATIONS OF CNC LATHE MACHINE

Advantages

Limitations

- Ease of program input.
- Multiple program storage.
- Online part programming and editing.
- Use of advanced interpolation.
- Automatic tool compensation.
- Auto generation of part program for existing components.
- Change in system of units.

- Higher investment cost.
- Higher maintenance cost.
- Requires specialised operators.

- DNC is a manufacturing system in *which a number of machines are controlled by a computer through direct- connection and in real time.*

- Also, defined as: DNC is a system connecting a set of NC machines to a common memory for part program or machine program storage with provision for *on- demand distribution of data to machines.*

- The tape reader is omitted.

- Involves data connection and processing from the lathe machine back to the computer.
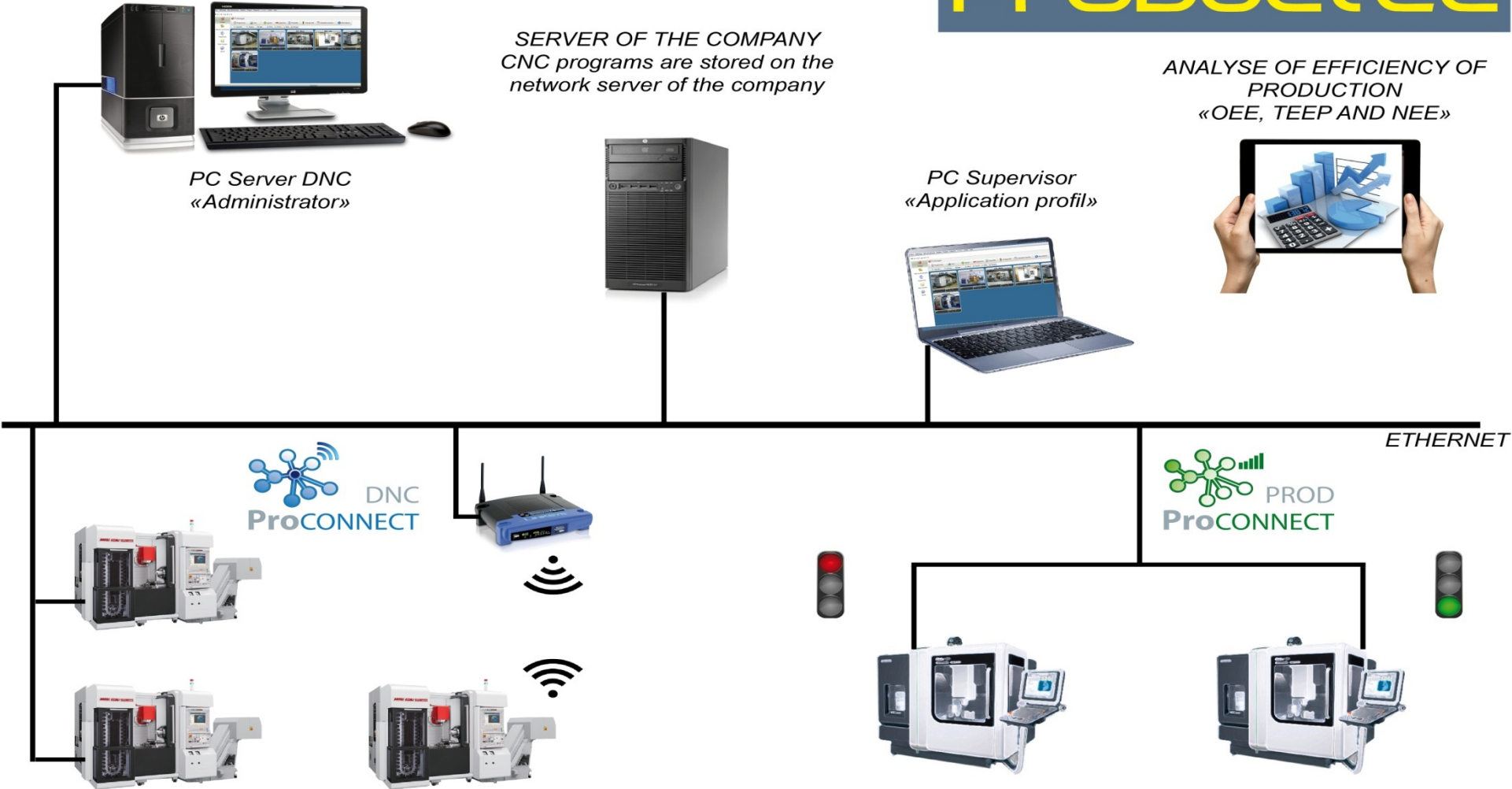
PRODUCTEC

SERVER OF THE COMPANY
CNC programs are stored on the
network server of the company

ANALYSE OF EFFICIENCY OF
PRODUCTION
«OEE, TEEP AND NEE»

PC Server DNC
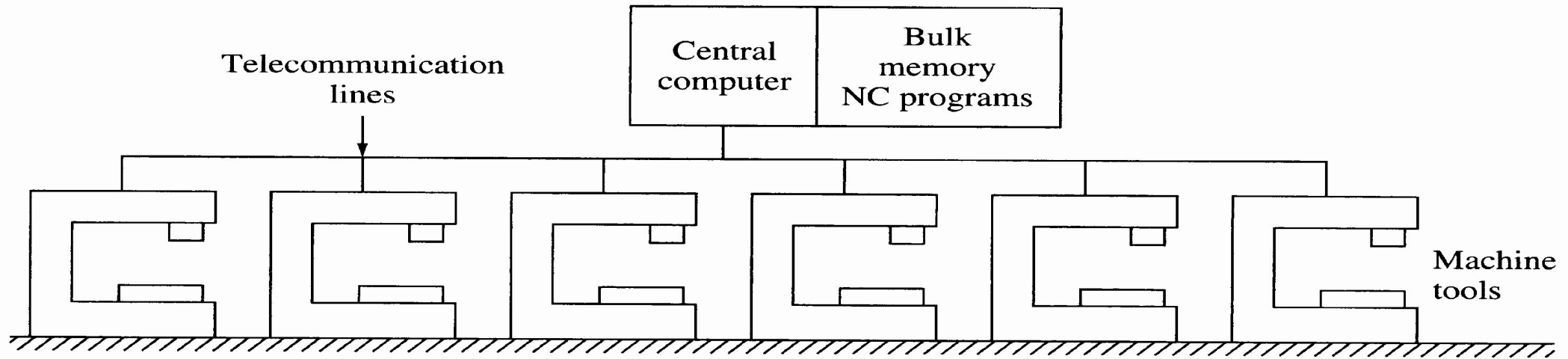«Administrator»

PC Supervisor
«Application profil»

ETHERNET

DNC
ProCONNECT

PROD
ProCONNECT

COMPONENTS

1. Central computer
2. Bulk memory which stores the NC part programs.
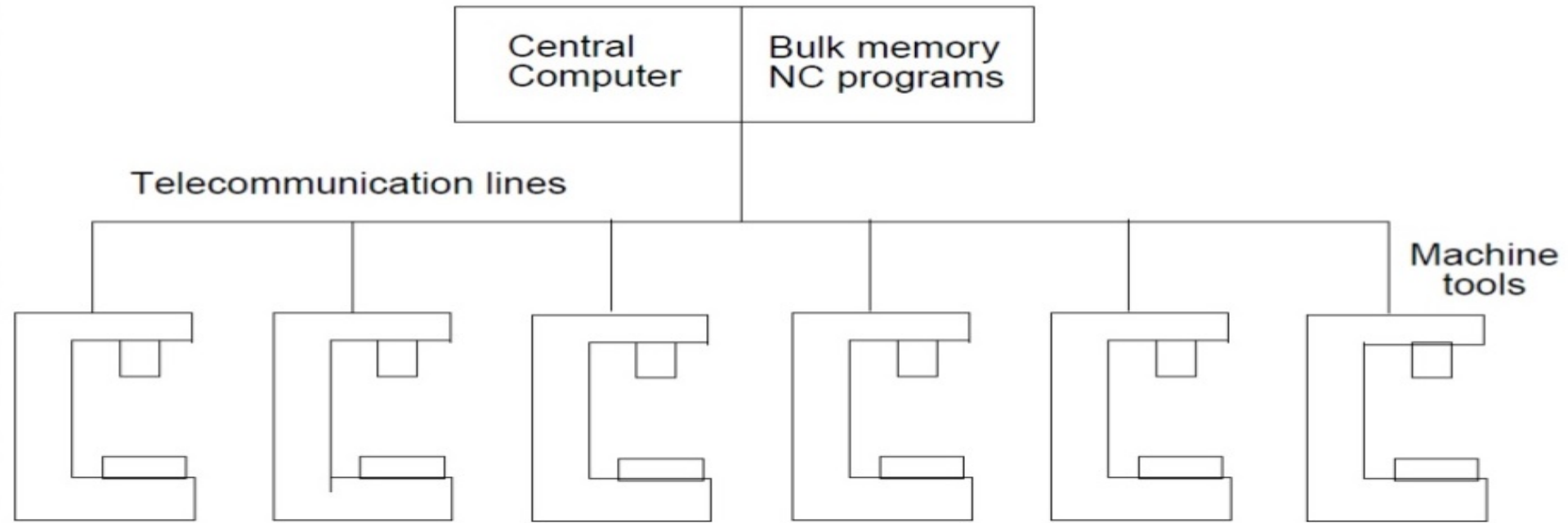3. Telecommunication lines
4. lathe machine.

PRINCIPLE

DNC machine

- A central computer *connected to a number of lathe machine and control them*
- Part program of all lathe machine are stored in the memory of the central computer and transmitted on direct transmission lines on demand
- Various lathe machine can communicate with the computer in real time
- Programs in full or segment can be transferred to NC machines
- Computer can be used for program editing
- No tape readers are used
- No limitation for the number or size of programs stored

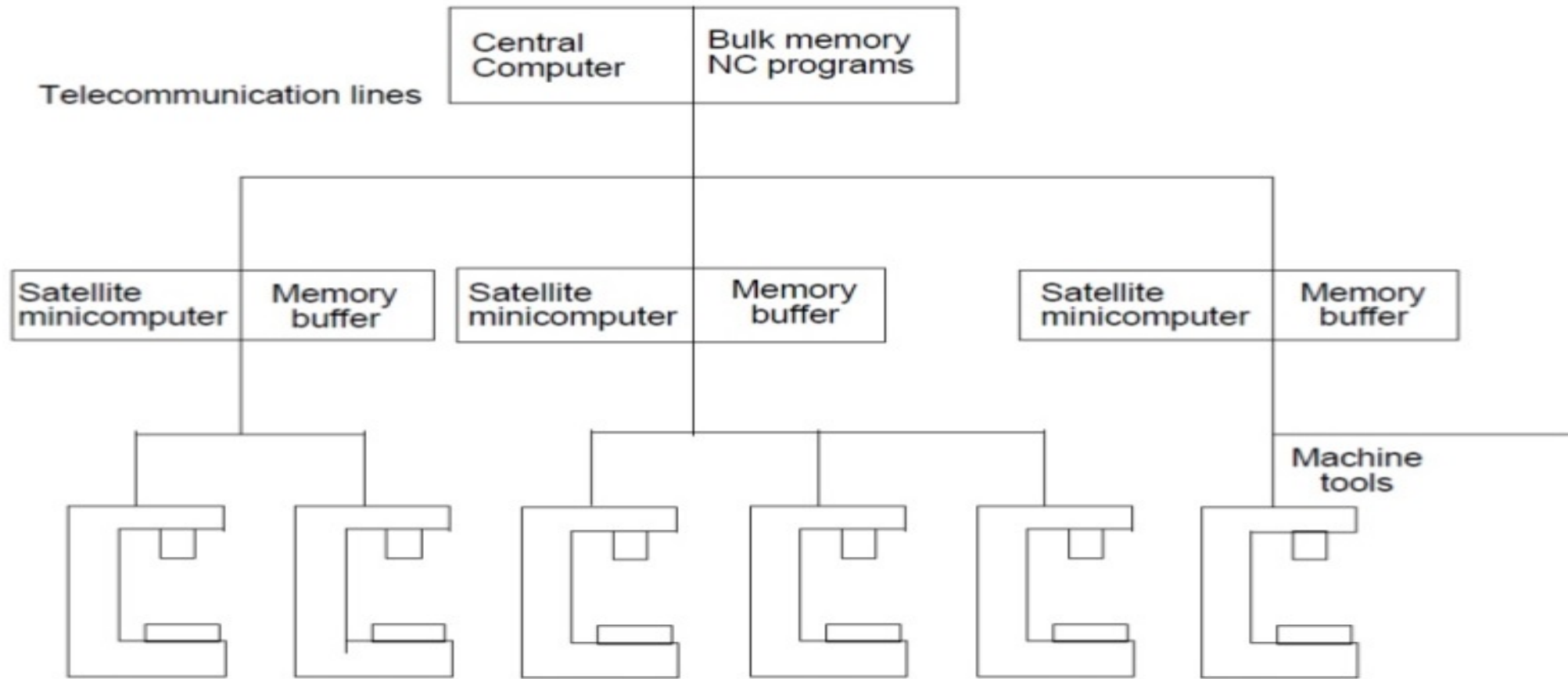The configuration of the DNC system can be divided into:

1. DNC system without satellite computer.
2. DNC system with satellite computer.

     Satellite computers are minicomputers and they serve to take some of the burden off central computer. Each satellites controls several lathe machine.

DNC SYSTEM WITHOUT SATELLITE COMPUTER

DNC SYSTEM WITH SATELLITE COMPUTER

The functions which a DNC system is designed to perform:

1. NC without punched tape.

2. NC part program storage.

3. Data collection, processing, and reporting.

4. Communication

ADVANTAGES OF DNC SYSTEM

- Elimination of punched tapes and tape readers
- Convenient storage of NC part programs in computer files
- Greater computational capability and flexibility
- Reporting of shop performance.
- Convenient editing and diagnostic features.

NC lathe machine System

1. The part program is fed to the machine through the tapes or other such media.

2. In order to modify the program, the tapes have to be changed.

3. In NC lathe machine system, tape reader is a part of machine control unit.

4. System has no memory storage and each time it is run using the tape.

5. It can not import CAD files.

6. It can not use feedback system.

7. They are not software driven.

CNC lathe machine System

1. In CNC lathe machine system, the program is fed to the machine through the computer.

2. The programs can be easily modified with the help of computer.

3. The microprocessor or minicomputer forms the machine control unit. The CNC machine does not need tape reader.

4. It has memory storage ability, in which part program can be stored.

5. System can import CAD files and convert it to part program.

6. The system can use feedback system.

7. The system is software driven.

DNC lathe machine System

1. The part program is fed to the machine through the Main computer

2. In order to modify the program, single computer is used

3. Large memory of DNC allows it to store a large amount of part program.

4. Same part program can be run on different machines at the same time.

5. The data can be processed using the MIS software so as to effectively carry out the Production planning and scheduling.

DIFFERENCE BETWEEN CAPSTAN & TURRET LATHE

Turret lathe:-

◉ Turret tool head is directly fitted on the saddle and both of them appear like one unit

◉ 2. Saddle is moved to provide feed to the tool.

◉ 3. It is difficult to move the saddle for feed.

◉ 4. As the saddle can be moved along the entire length of the bed, it is suitable for longer workpieces.

◉ 5. To index the turret tool head, a clamping lever is released and the turret is rotated manually.

◉ 6. Limit dogs are used to control the distance of tool movement.

◉ 7. Some turret lathes have the facility of moving the turret at right angles to the lathe axis.

◉ 8. Heavy and sturdy.

◉ 9. Suitable for machining heavy and large workpieces

◉ 10. Machining can be done by providing more depth of cut and feed.

Capstan lathe:-

◉ Turret head is mounted on a slide called ram which is mounted on the saddle.

◉ 2. To provide feed to the tool, saddle is locked at a particular point and the ram is moved.

◉ 3. It is easy to move the ram for feed.

◉ 4. As the movement of the ram is limited, it is suitable for machining shorter workpieces only.

◉ 5. When the handwheel for the ram is reversed, the turret tool head is indexed automatically.

◉ 6. To control the distance of tool movement, feed stop screws are provided at the rear side of the turret.

◉ 7. No such facility.

◉ 8. Lighter in construction.

◉ 9. Only small and light work pieces are machined.

◉ 10. Only limited amount of feed and depth of cut are provided for machining

Thank you