

Principles of Project Management

Module 3 Project Planning



Project Planning



- Planning is a pre-emptive [vorweggenommene] consideration of future activities
- Based on the “five friends, who taught me all I know” [W-Fragen]
- Allows consideration of alternatives
- Mistakes are inexpensive

Questions, PjM Tasks & Deliverables I



- What needs to be done?
 - structure project
 - **Work Breakdown Structure** [Projektstrukturplan]
 - **Work Packages** [Arbeitspakete]
- Who does it?
 - determine resources
 - refined Work Packages
- What are the most important events?
 - define milestones
 - **Milestone Plan** [Meilensteinplan]

Questions, PjM Tasks & Deliverables II



- When must the work be done?
 - determine sequences
 - determine interdependencies
 - Time Line (aka **Project Plan**) [Terminplan]
 - **Gantt Chart** [Balkanplan]
 - **PERT Diagram** [Netzplan]
- What effort and costs are involved?
 - determine effort and costs
 - **Resource Plan** [Ressourcenplan]
 - **Cost Plan** [Kostenplan] - against Budget

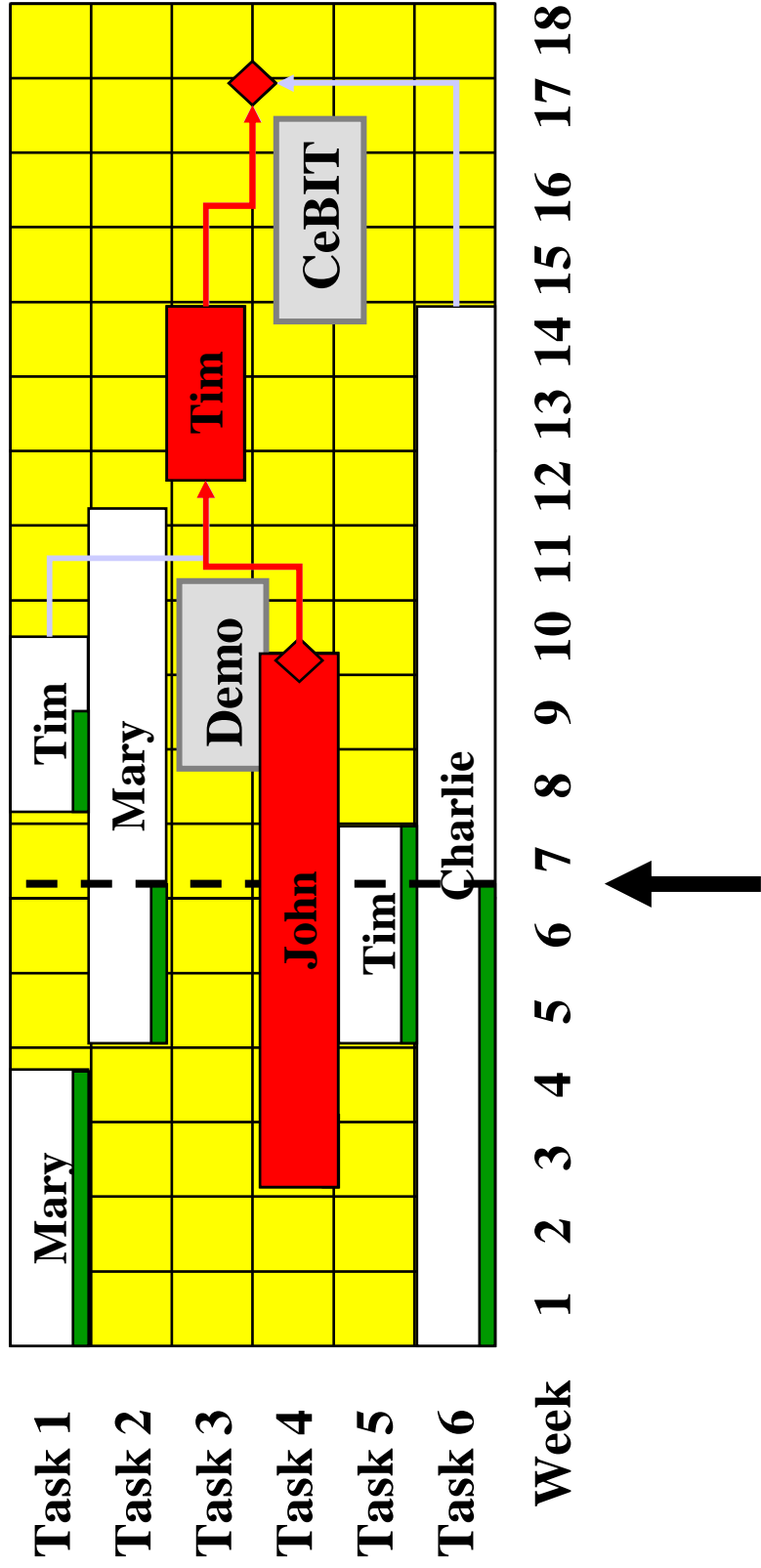
Questions, PjM Tasks & Deliverables III



- How can the project goals be met?
 - refine plan
 - balance time, resources and costs
 - optimised plan [Planoptimierung]
- Where are the risks?
 - analyse risks
 - **Risk Analysis** [Risikoanalyse]
 - including mitigation strategy

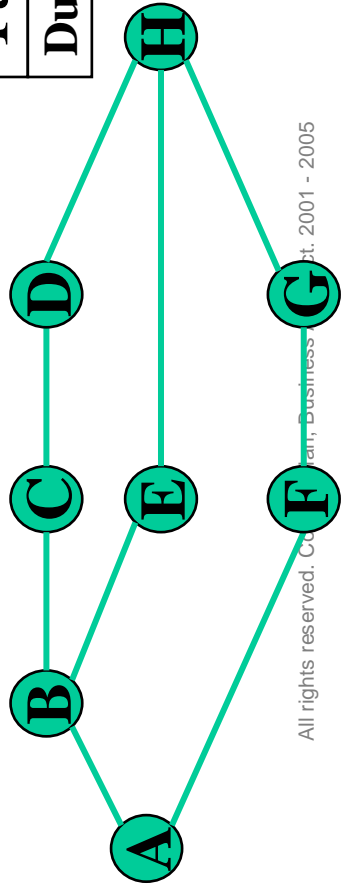
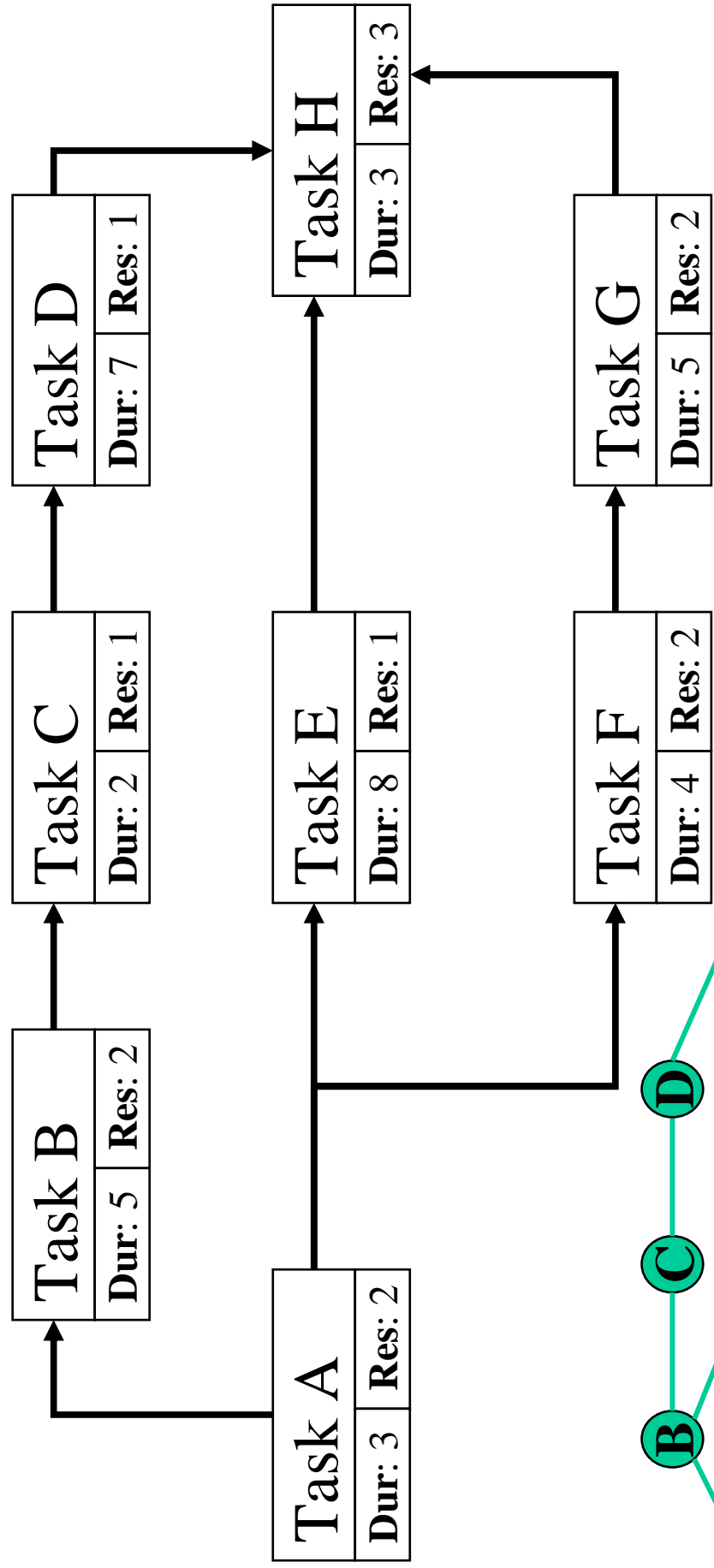


GANTT Chart





PERT Diagram



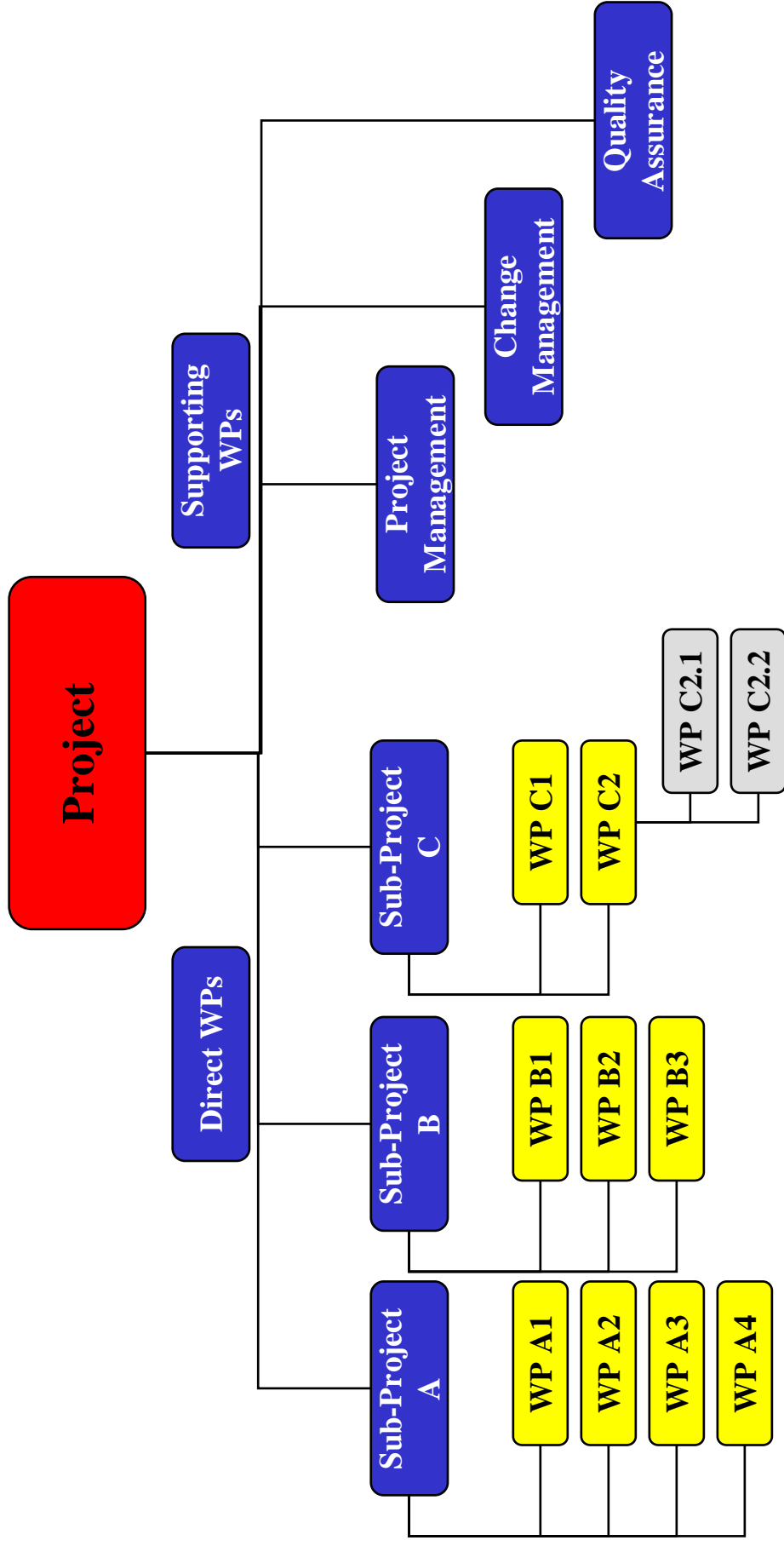


Work Breakdown Structure



- Important management and analysis tool
- Breaks project into manageable chunks
 - sub-projects
 - tasks, task groups
- Reduces complexity, eases planning
- Facilitates completeness checks
- Basis for (later) optimisation
- Concerned only with subject matter

Example: WBS



WBS Methods



- **Top-Down**
 - from overview (Project Goal) to detail (WP)
 - commonest method
 - detail enhanced in the process
- **Bottom-Up**
 - from detail (WP) to overview (Project Goal)
 - useful when details known, pre-determined
 - cross-check - replacing existing systems
- **Brain-Storming, Mind-Mapping etc**

Have you read ... ?



- **Business Mind Mapping**(German)
Tony Buzan, Vanda North; ISBN 3-7064-0577-6
- *MindManager Student Edition (Software)*
- **Creative Thinking and Brainstorming**
J Geoffery Rawlinson; ISBN 0-7045-0543-6
- **Rapid Problem Solving with Post-It® Notes**
David Straker; ISBN 1-55561-142-7
- **The Thinker's Toolkit**
Morgan D Jones; ISBN 0-8129-2808-3

WBS Principles



- **Object / Artefact based**
- **Activity based**
- **Phase based**
- **Mixed Forms**

Work Packages (WP)



- Tasks, events, activities
- Basis for all (project) planning
- Lowest level of WBS
- Someone is responsible for each WP
 - ensures that the agreed deliverables are produced within the agreed cost and time constraints

WP Definition



- Project name and **number**
- Project Manager's name
- Work Package **number** (hierarchical)
- Work Package **name**
- Person **responsible** for WP
- Cost centre
- WP **goal(s)** and **deliverables**
- Pre-requisites (preceding WPs)
- Space for **signatures** (WP ~ contract)

WP - Sample Definition



Project Number:	225	Project: B2 Series	Project Manager: John Murphy
WP-Number:	4.2.5	WP-Name: Test Production Run	WP Responsibility: Tom O'Dwyer
Cost Centre:	75		
Goals & Deliverables:	<ul style="list-style-type: none"> # Production workers are trained in the use of the production equipment # The 0 series (10 units) of the model B2 is produced # The start-up problems have been resolved # Changes (setup and processes) have been documented 		
Pre-Requisites:	<ul style="list-style-type: none"> # The production line is completed (WP 3.5.3) # The production material is available and prepared (WP 3.5.9) 		
Approved / Agreed			
Project Manager:		Date	Signature
WP Responsibility:			Comment



Milestone Plan



- Provides quick and quality overview of project
- Provides structure by determining dates for specific (sub) goals
- Reviewing milestones (is the goal achieved?) provides project status

Milestones



- Important events or deliverables
 - goals, sub goals, completion of sub projects that must be achieved within the project
- Motivation factor for team members
 - success factor - goal/date achieved
 - (positive) stress factor - getting it done
- Often result in monetary reward
 - external projects - payment goal
 - project team - bonus payments

Milestone Definition



- Project name and **number**
- Project Manager's name
- Milestone **number** (hierarchical)
- Milestone **name**
- Person **responsible** for milestone
- Milestone **definition** and **deliverables**
- Pre-requisites (preceding WPs)
- Space for **signatures** (Milestone is often contract event ~ payment)

Milestone - Sample Def.



Project Number:	225	Project:	B2 Series	Project Manager:	John Murphy
Milestone-Number:	4.3.1	MS-Name:	B2 Production	WP Responsibility:	Tom O'Dwyer
Cost Centre:	75		commenced		
Goals & Deliverables:	Production commenced with 35 Units "B2" / day				
Milestone Date:	26th May 2002				
Pre-Requisites:	# The production line is completed (WP 3.5.3)				
	# Production line staff are trained (WP 3.5.5)				
	# The production material is available and prepared (WP 3.5.9)				
Approved / Agreed	Date	Signature	Comment		
Project Manager:					
WP Responsibility:					

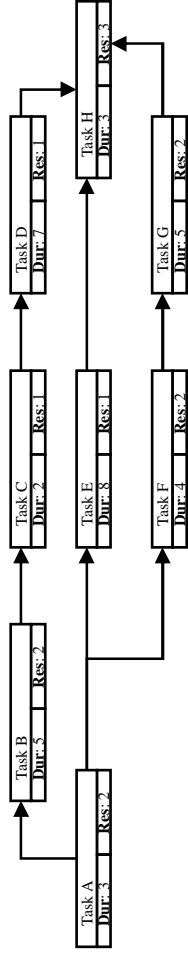


Sequence Planning



- Precedes the actual project plan
- Determines the sequence in which work must be done
- Can be diagrammed as
 - Histogram (Balcken Diagramm) ~ Gantt
 - Network Diagram (Netzplan) ~ PERT
- “As much detail as necessary, as little as possible”

Network Diagram

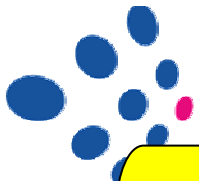


- More precision
- Better suited to large projects
- Requires PjMt Software
- Needs experience, feeling for appropriate level of detail
- Project team often have difficulty understanding PERT Diagrams

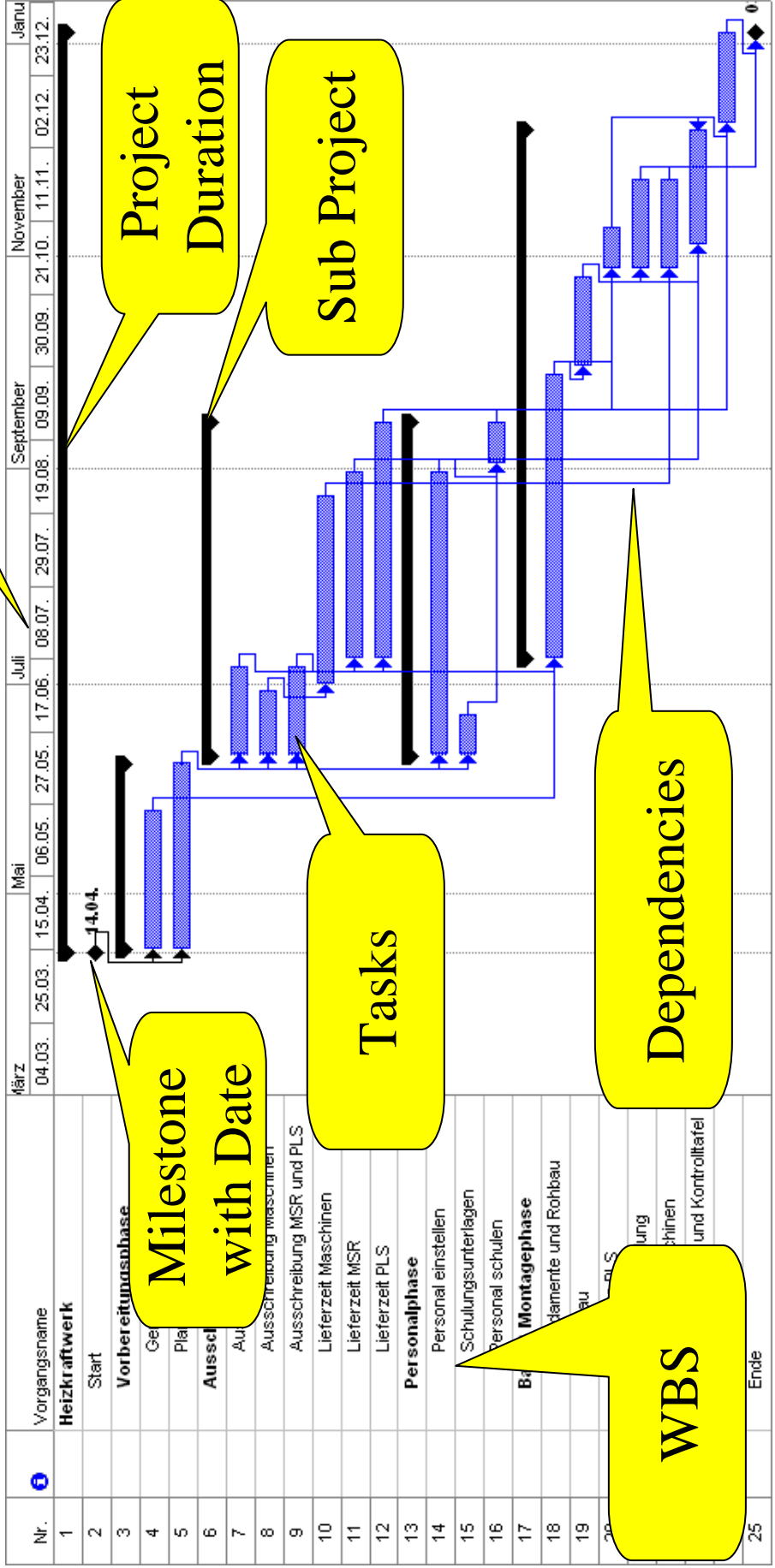
Types of Network Diagrams

- Critical Path Method (CPM)
 - Tasks and arrows net [Vorgangspfeilnetz]
- Program Evaluation and Review Technique (PERT)
 - Event node net [Ereignisknotennetz]
- Metra Potential Method (MPM)
 - Task node net [Vorgangsknotennetz]
- Methodology Gurus !

Finally - MS Project



Time Line



Milestone with Date

Tasks

WBS

Dependencies

Project Duration

Sub Project

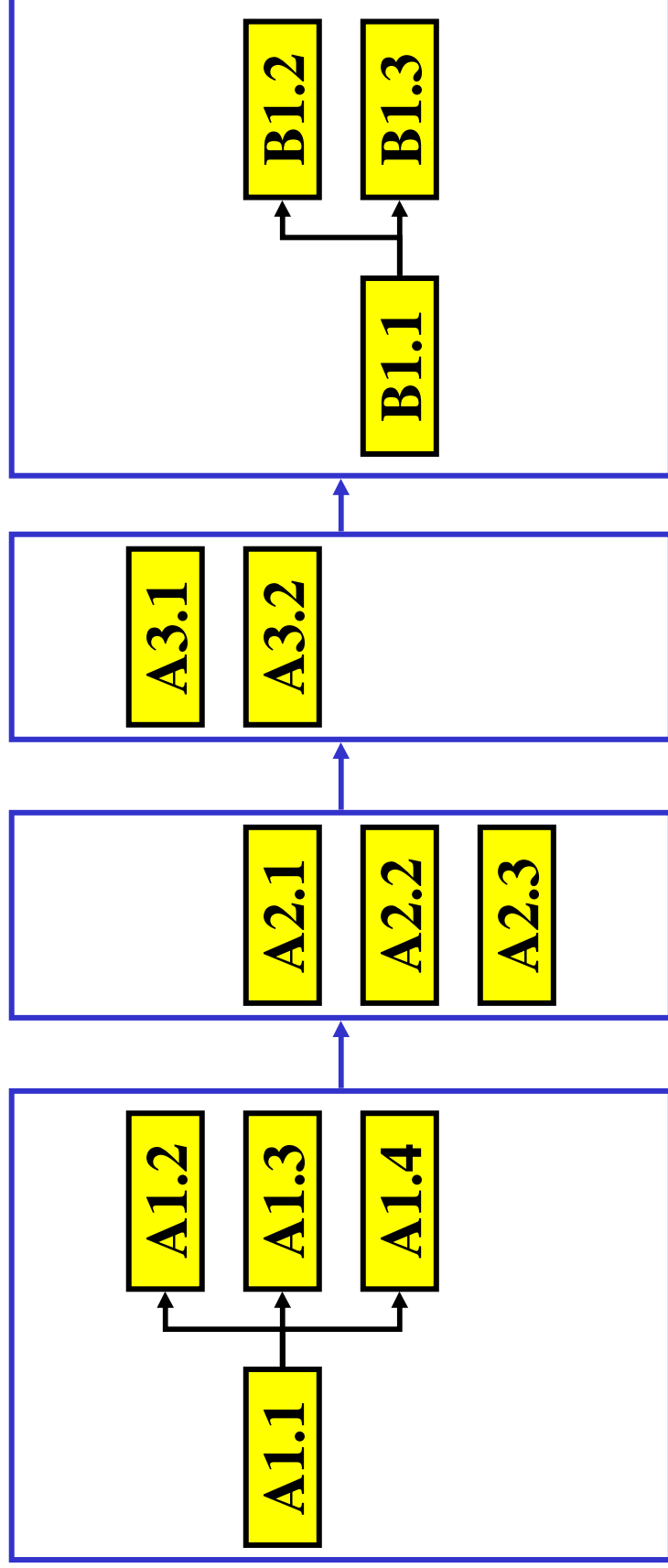
Dependency Rules



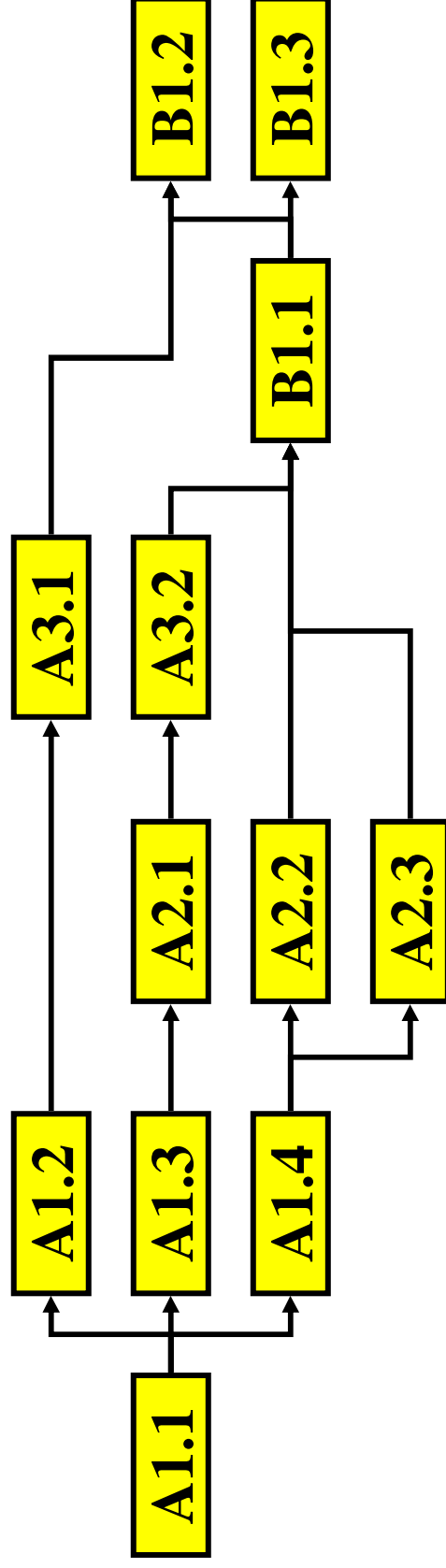
- The first WP has no predecessor
[Vorgänger]
- The last WP has no successor
[Nachfolger]
- All other WPs have at least one predecessor and one successor
- Left to right (like Top-Down)
- Right to left (like Bottom-UP), as check



Creating the Network I



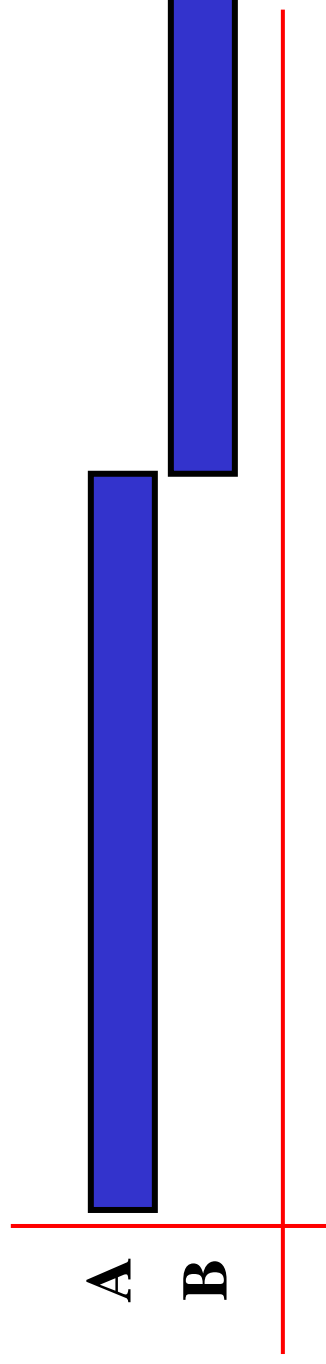
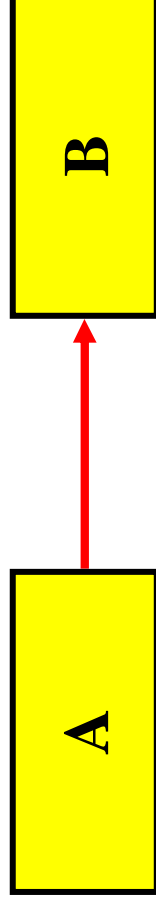
Creating the Network II



Dependencies I



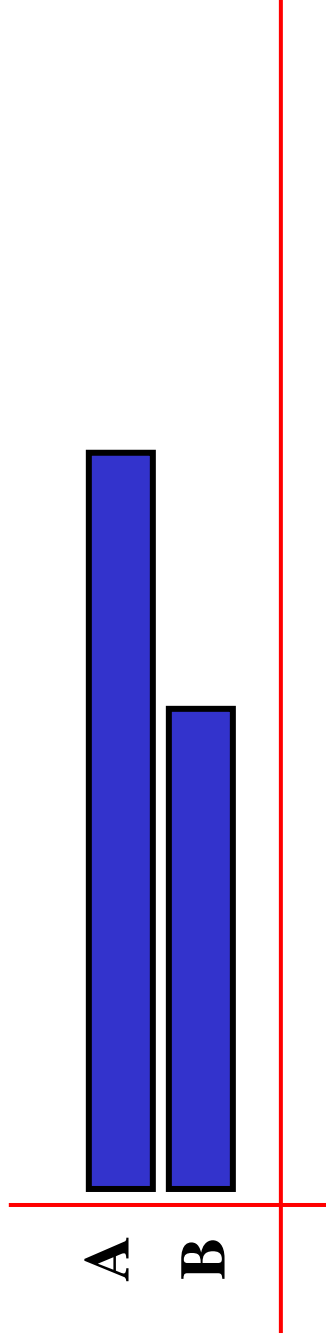
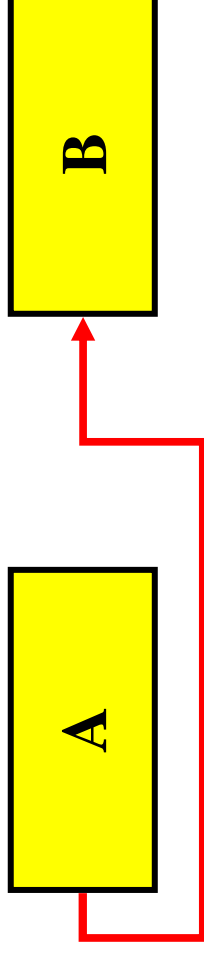
**End to Start [Ende-Anfang]
[Normalfolge]**



Dependencies II



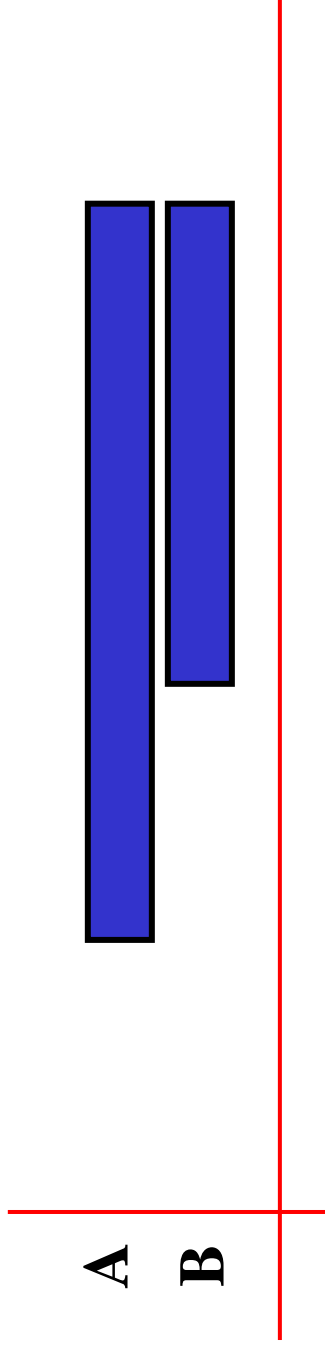
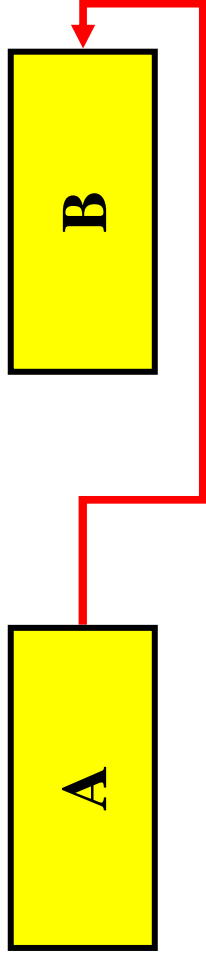
**Start to Start [Anfang-Anfang]
[Anfangsfolge]**



Dependencies III



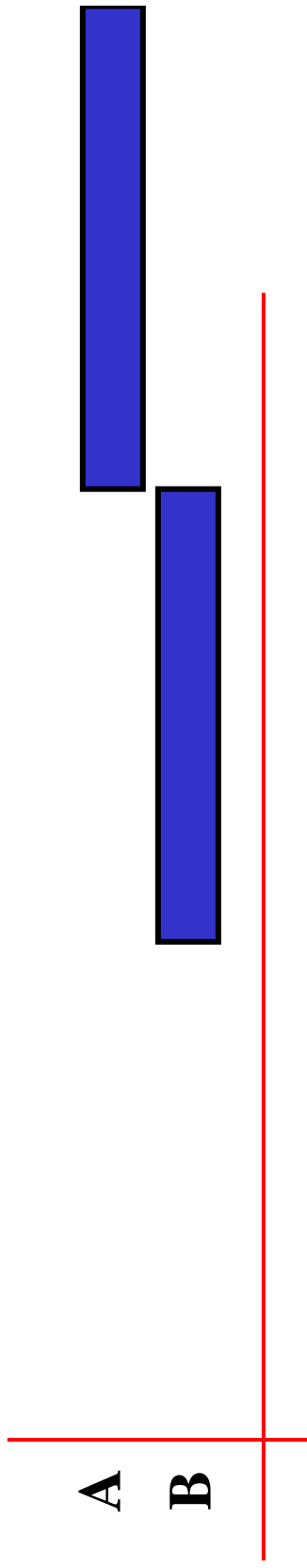
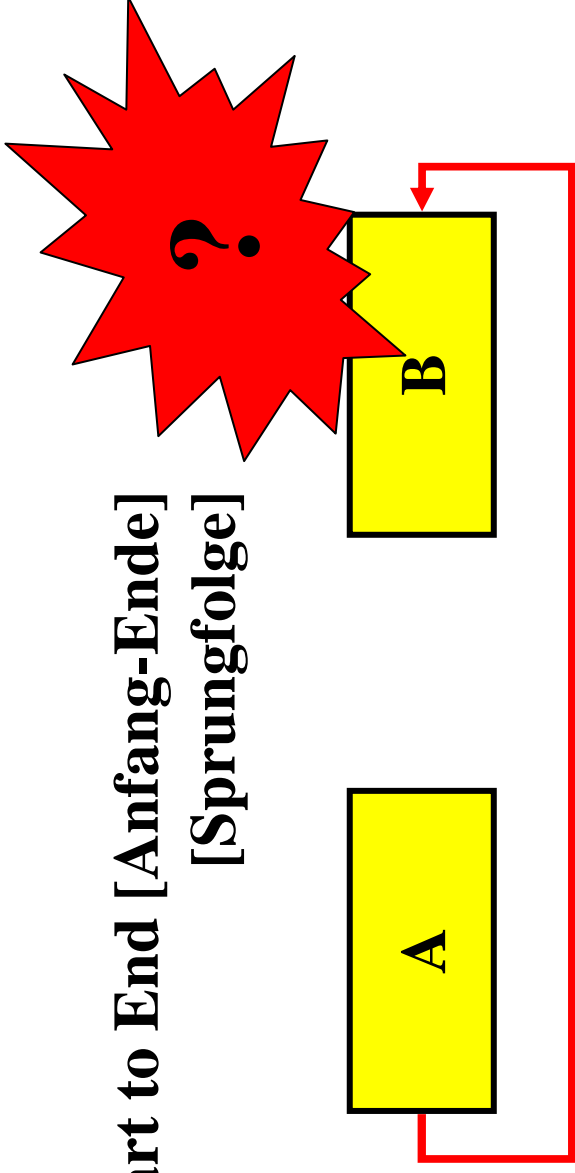
**End to End [Ende-Ende]
[Endfolge]**



Dependencies IV



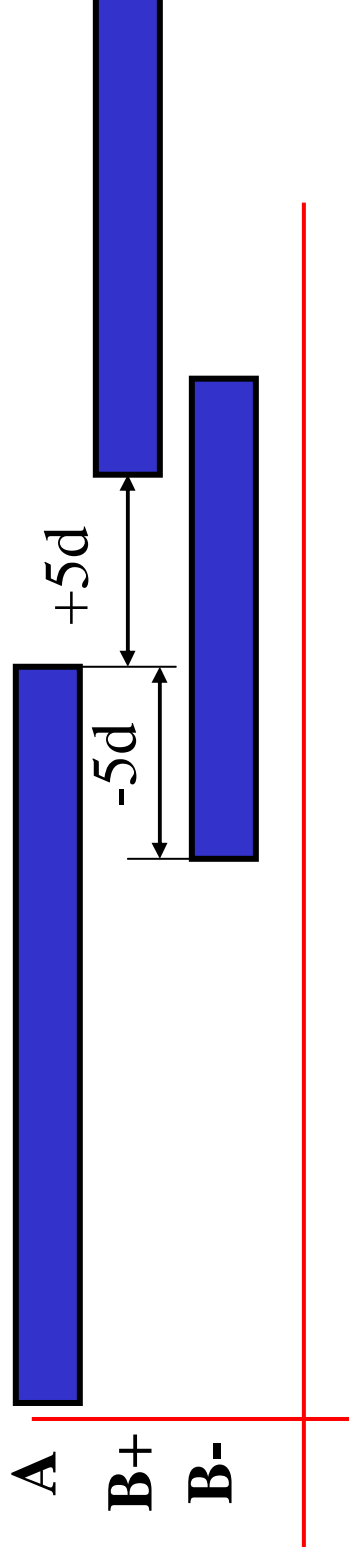
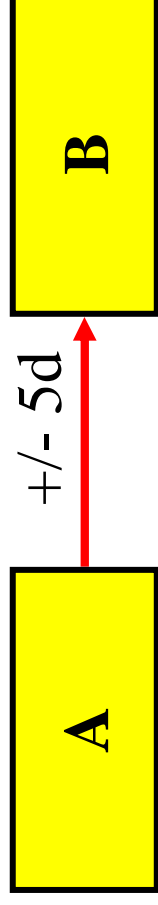
**Start to End [Anfang-Ende]
[Sprungfolge]**



Dependencies V



Time Lags [Zeitverschiebungen]



Dependencies - Summary



- Ende-Anfang (EA) • Anfang B gekoppelt an Ende A
- Anfang-Anfang (AA) • Anfang B gekoppelt an Anfang A
- Ende-Ende (EE) • Ende B gekoppelt an Ende A
- Anfang-Ende (AE) • Ende B gekoppelt an Anfang A
- +/- Zeitverschiebung

WP Time Constraints

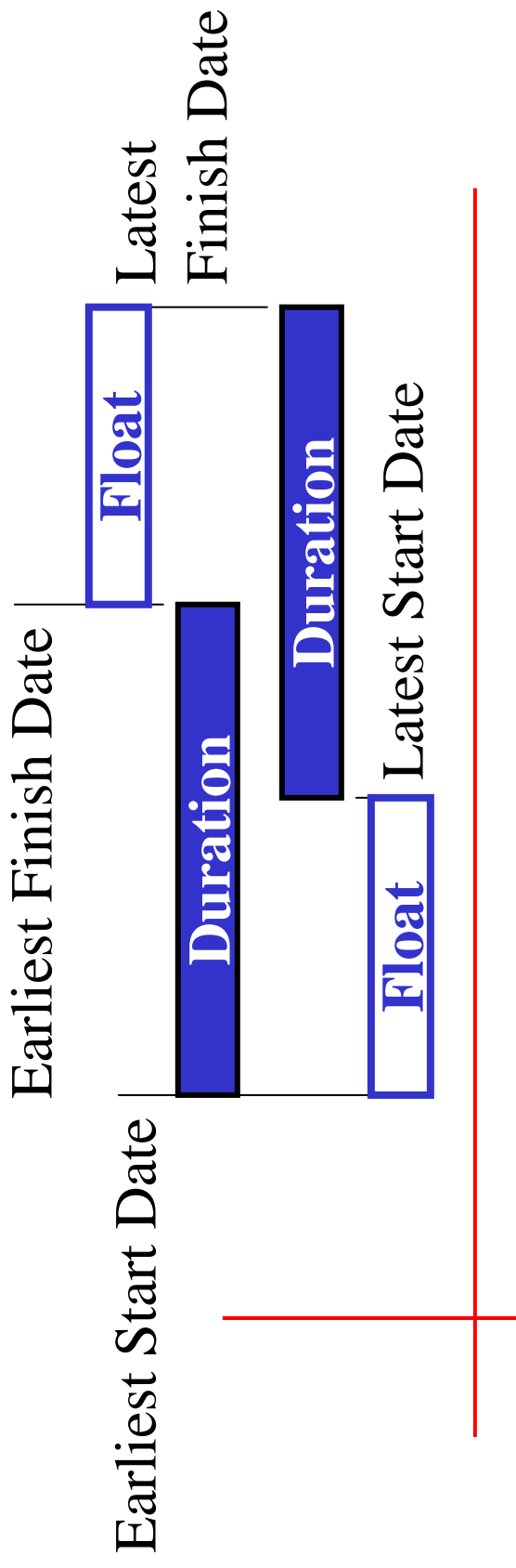


- **Flexible Constraints**
 - As early as possible
 - End no earlier than
 - End no later than
 - As late as possible
 - Start not earlier than
 - Start not later than
- **Fixed Constraints**
 - Must end by
 - Must start by
- **Beware the mouse in MSP Gantt Charts !**

Buffers and Puffers



- Latest Start minus Earliest Start
- Latest Finish minus Earliest Finish
- Float (Slack) = **one of the above**



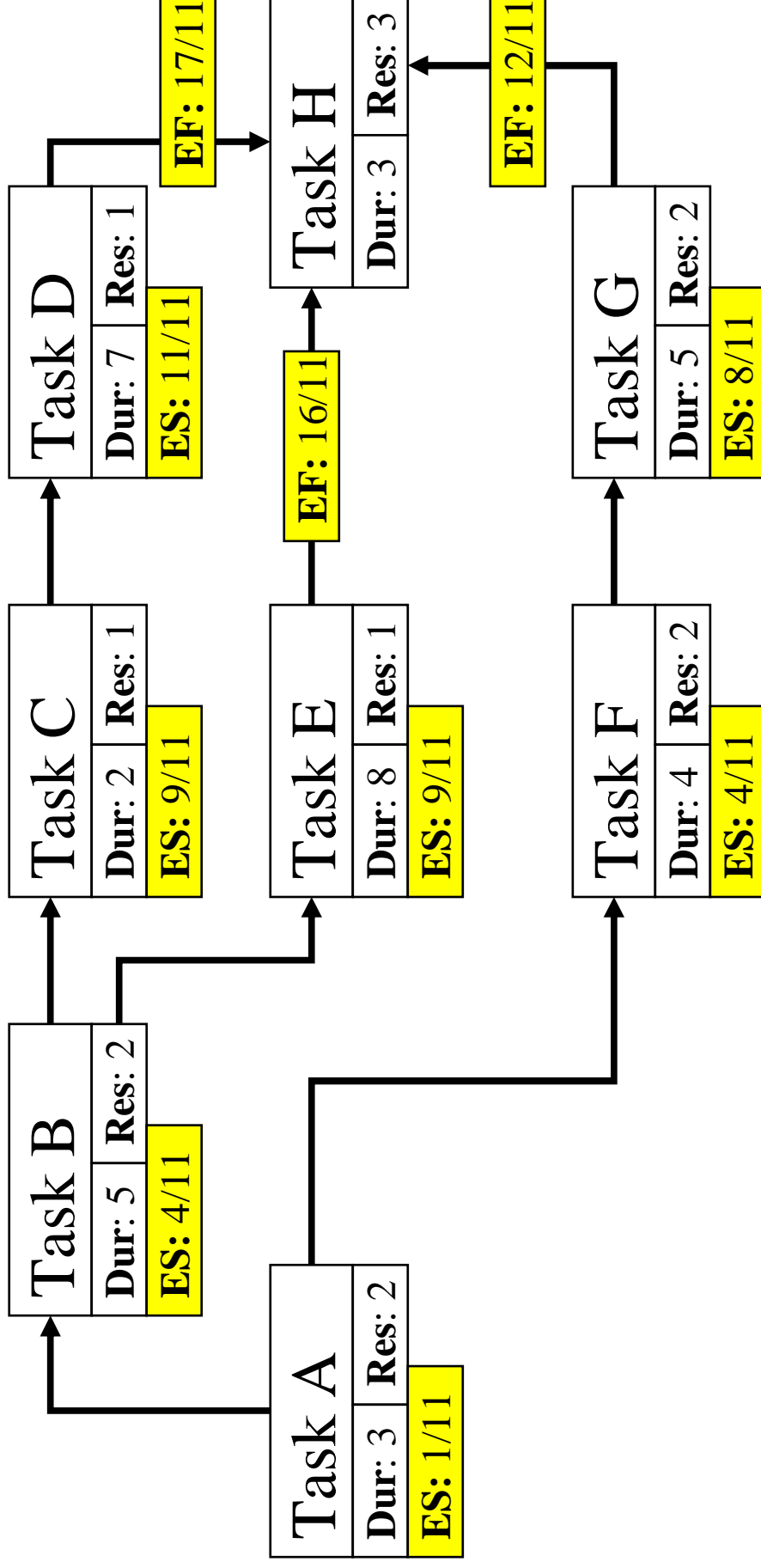
Critical Tasks



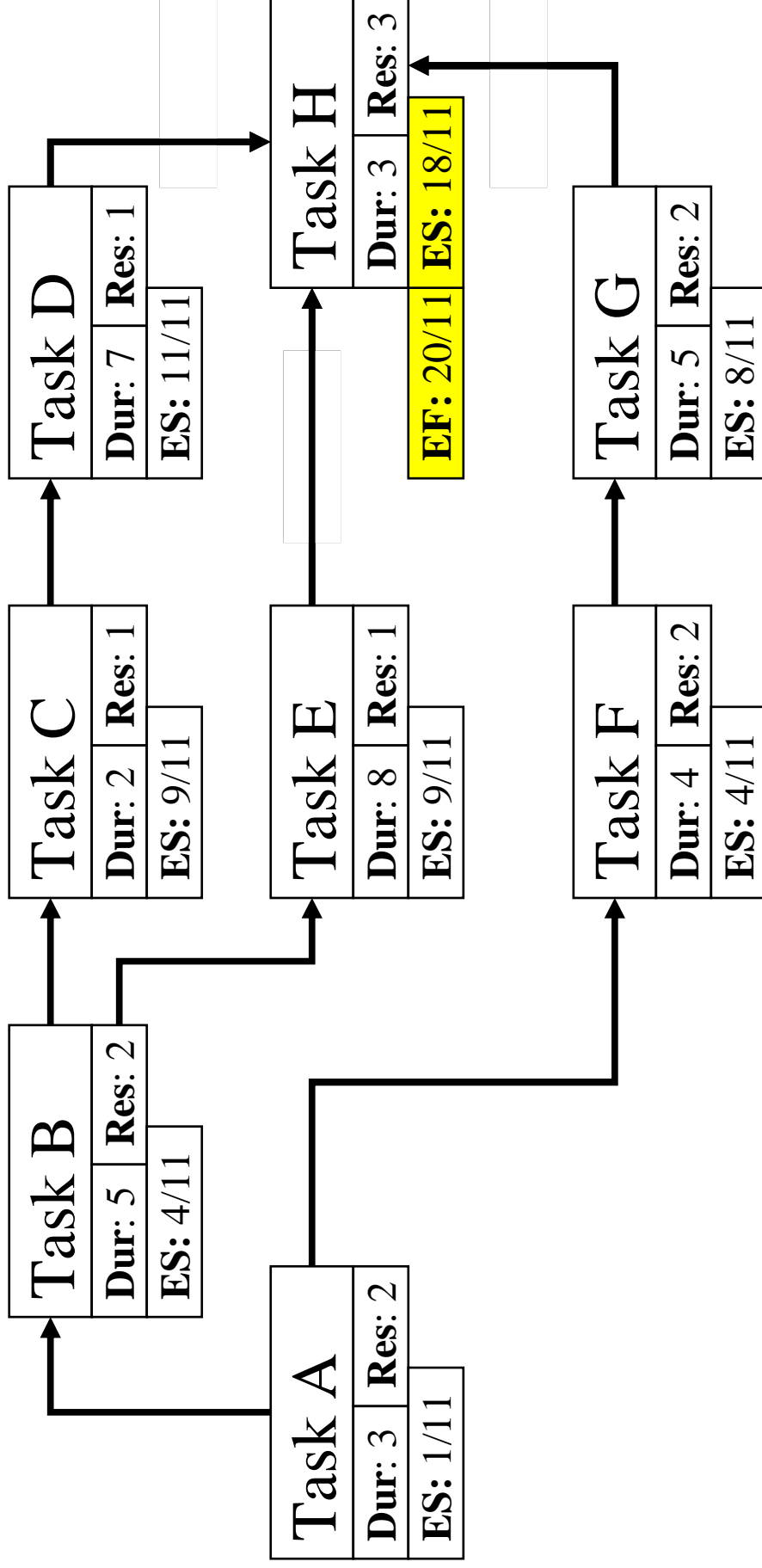
- Tasks where the earliest and latest dates are **identical** ($ES=LS$ or $EF=LF$)
- Tasks with no float or slack
- Delays directly effect **project completion**
- **Critical Path** is sequence of critical tasks
- Float and (therefore) critical tasks are calculated by the **Front Pass, Back Pass**



CPM - Front Pass I

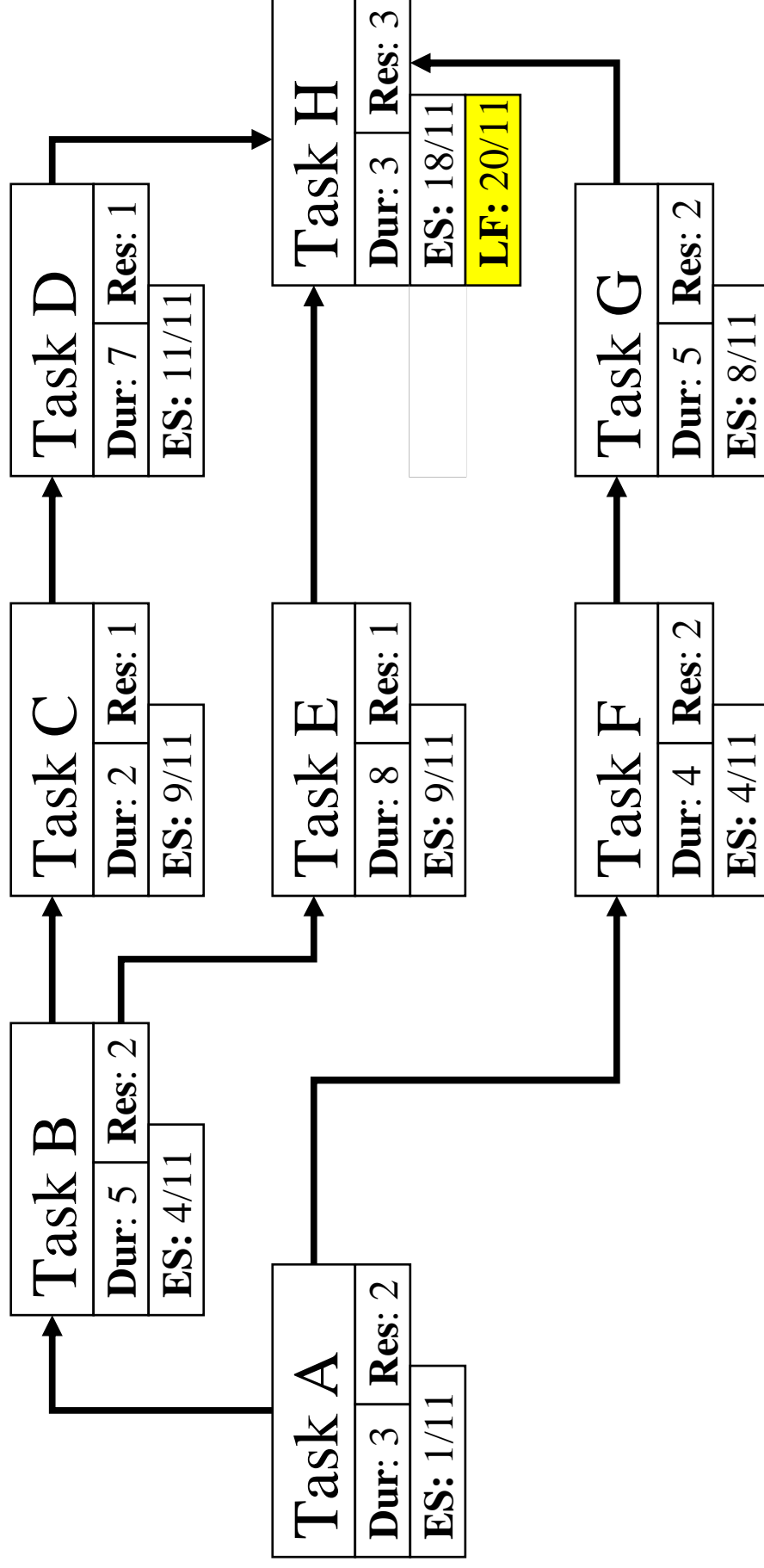


CPM - Front Pass II



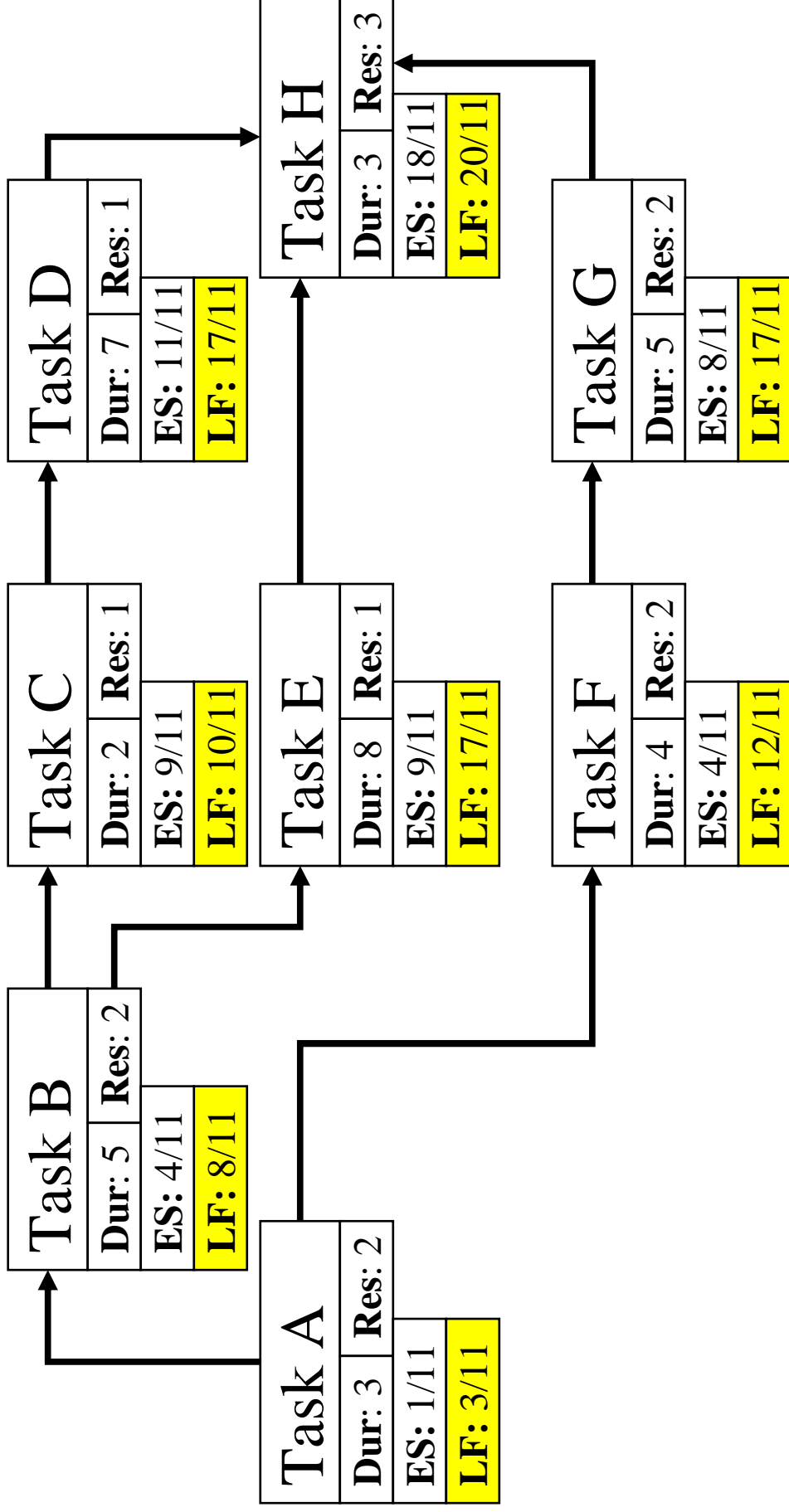
Project Duration: 1/11 - 20/11

CPM - Back Pass I

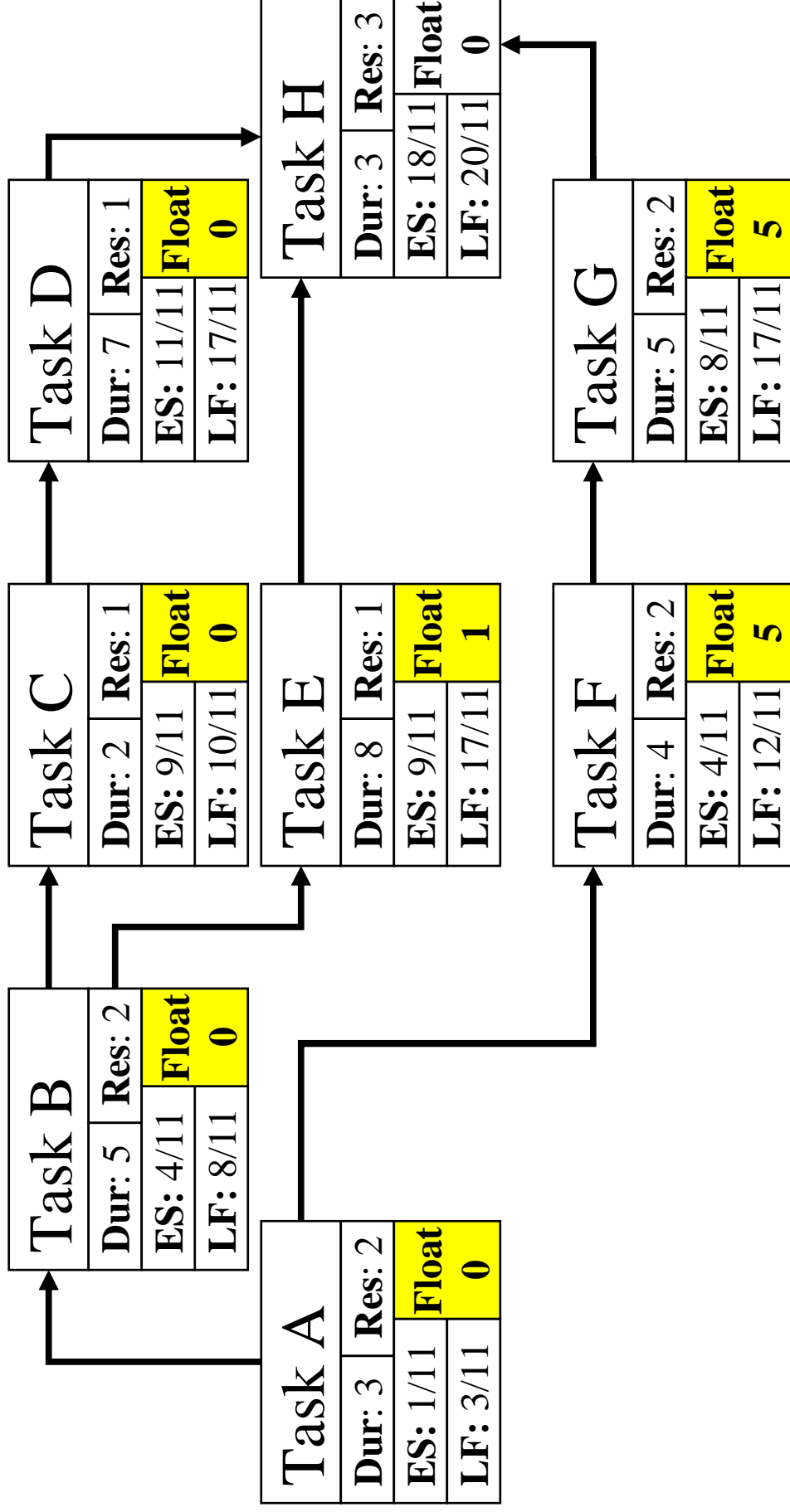


Project Duration: 1/11 - 20/11

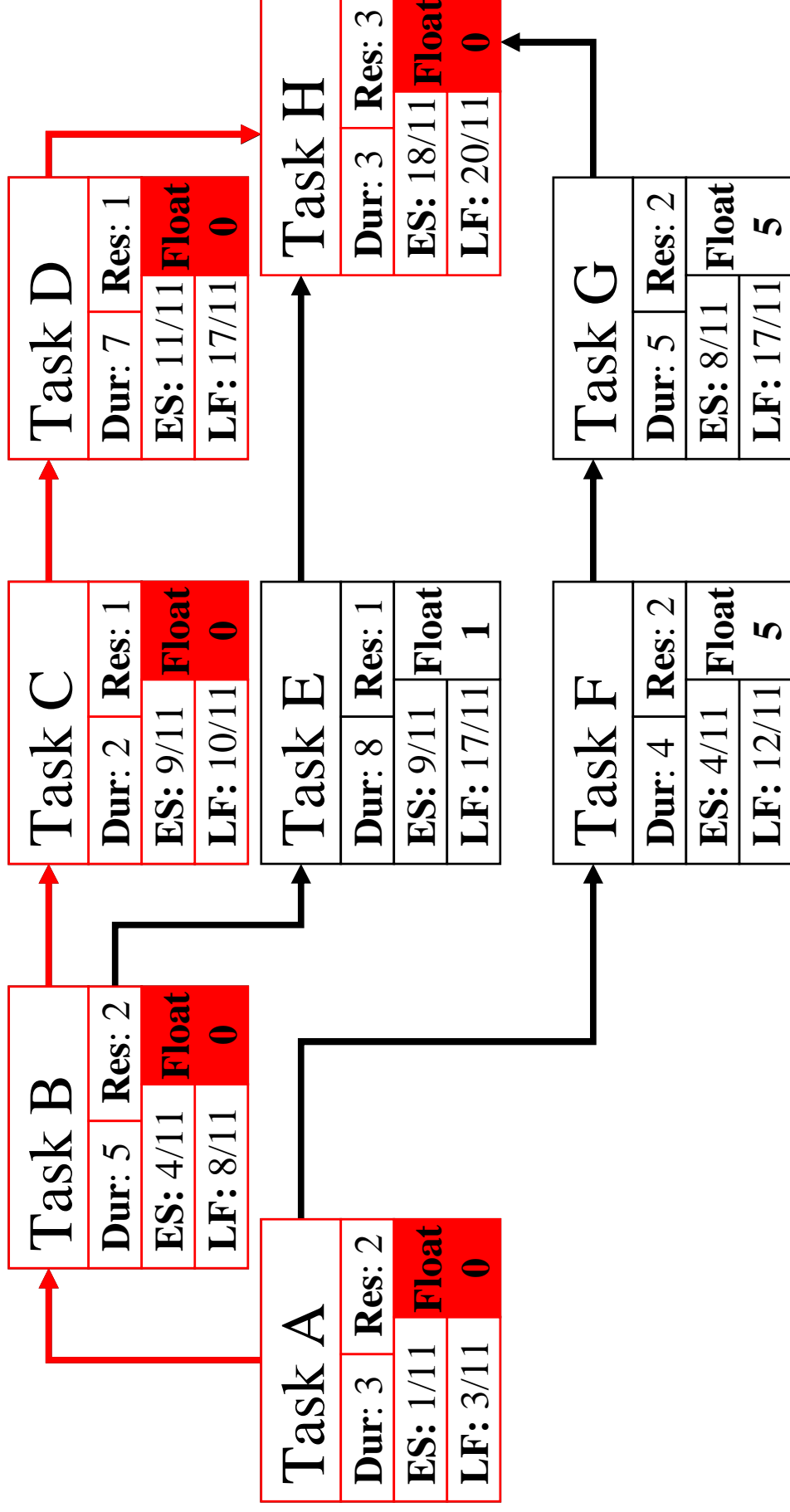
CPM - Back Pass II



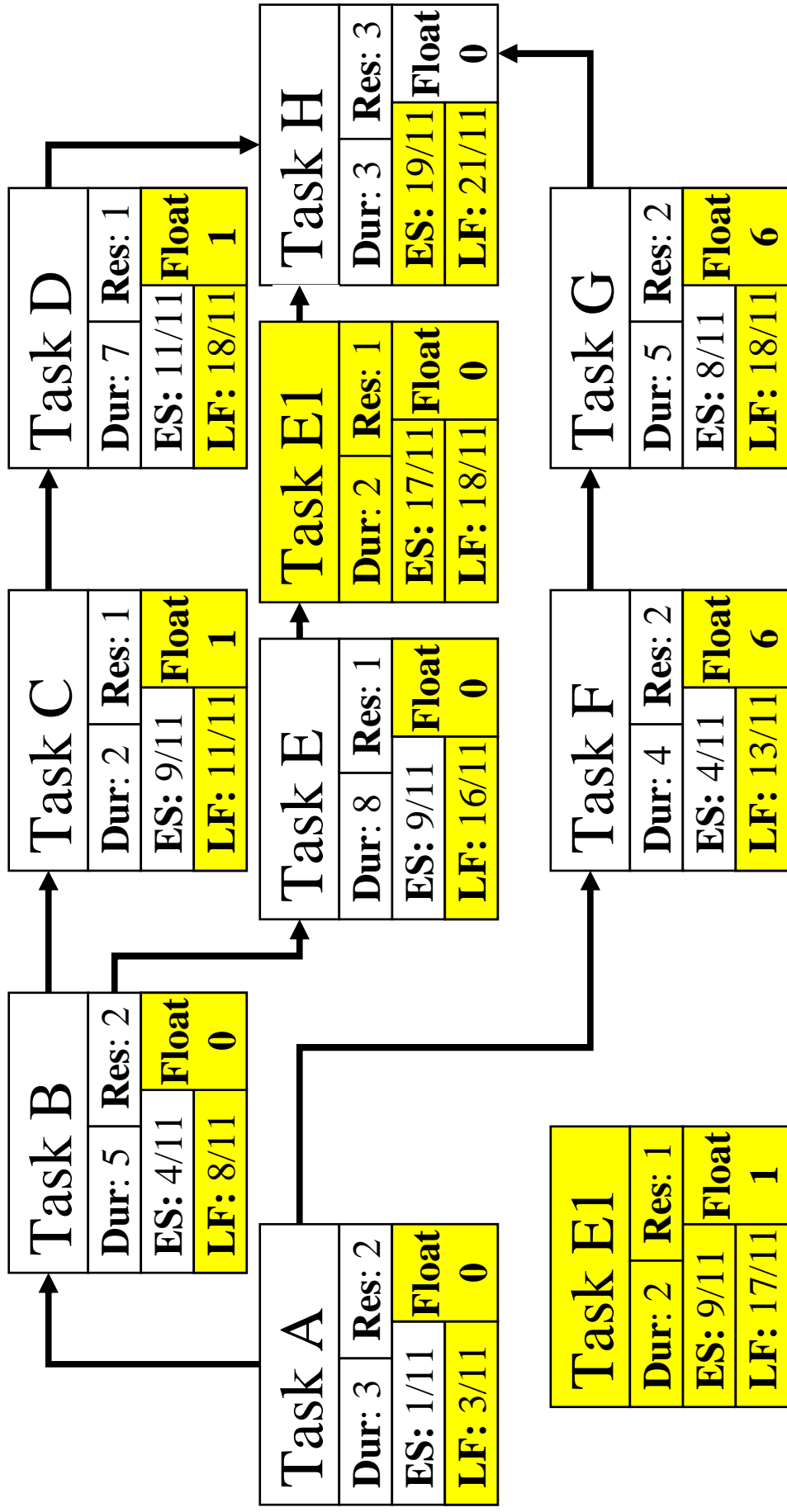
CPM - Critical Path I



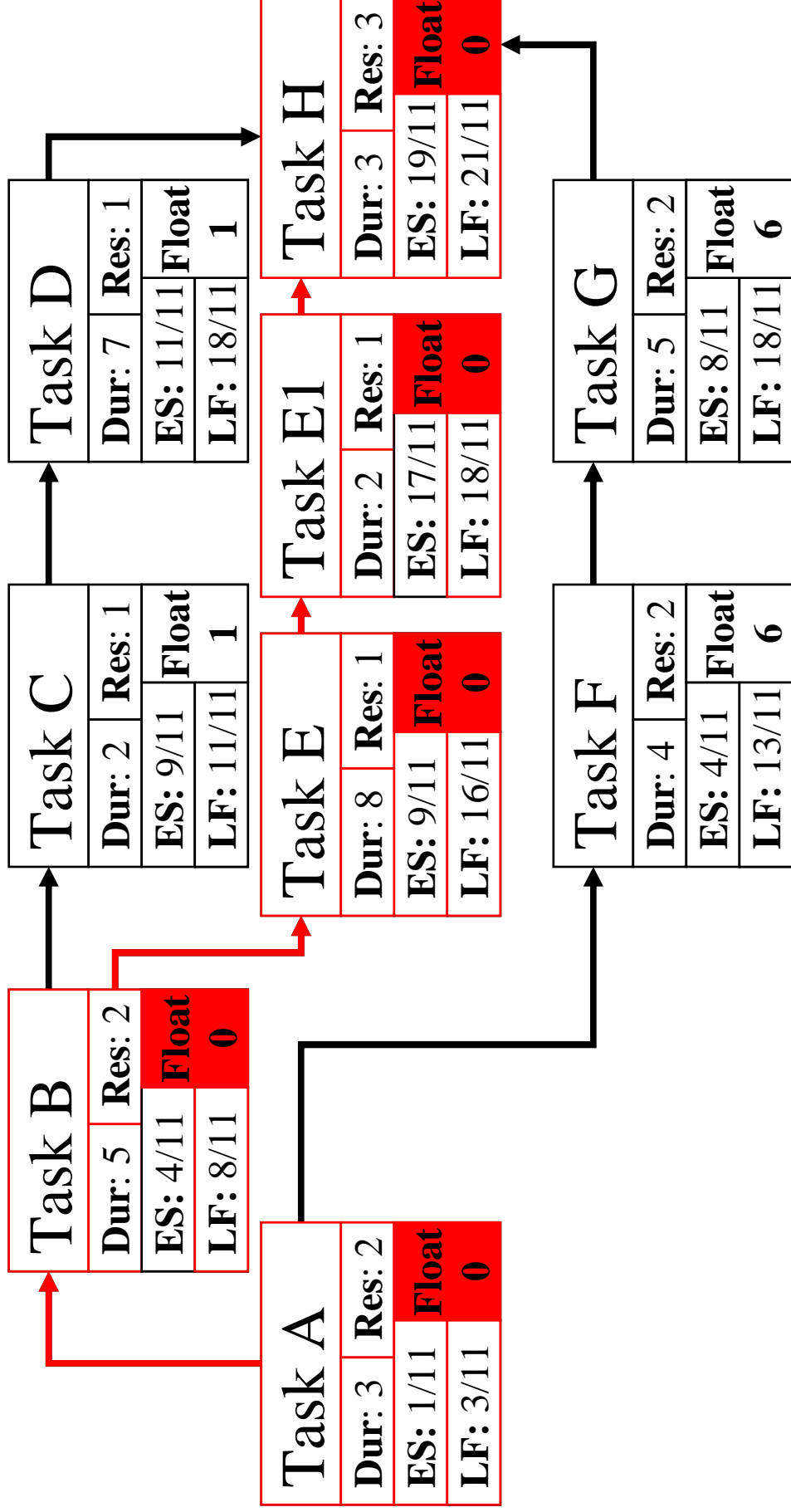
CPM - Critical Path II



CPM - Dynamic CPM I



CPM - Dynamic CP II





Resource Planning I



- Distinguish between effort [Aufwand] and duration [Dauer]
- Remember this? “If it takes 5 men 10 days to dig a hole, how long will 10 men need?”

Fixed Effort

e.g. digging a hole

10 Men

Duration

5 Men

Duration

Fixed Duration

e.g. Test under load



Duration

Duration

Resource Planning II



- Work Packages as basis
- WP Owner estimates effort, resources
 - Best guess (based on experience, tools)
 - Ask the people doing the work
 - Include **testing, quality and documentation!**
 - People-Effort in person-days, person-hours
 - Equipment in units or %age usage
- Duration = Effort/Resources
 - in weeks, days, hours

Resource Planning III



- Tasks, activities within WP are listed
- Resources (duration, number) defined

Resource	Effort (PD)	Resource Allocation	Resource Usage	Duration
Production Manager	5	0,5	50%	10
Production Workers	20	5	500%	4
QM Manager	2	1	100%	2
etc etc				
Total Effort: 27 Person-Days			Duration: 10 Days	

Duration

Allocation

WP Duration

Insurance



- Not (Yet) Allocated Resources (NYA)
 - Time and Money for items not yet recognised
 - Separate Task
 - Include in plan and in reporting
 - Reduce (as needed) by allocating resources to other tasks and activities
 - Allows isolated budget overruns without overall project overrun
 - Do not waste these not yet allocated resources
 - if not needed, deliver the project early!

Example: Not yet allocated



<u>Proposal</u>		<u>Execution</u>	
Task	Budget	Task	Activities
A		A	A1
	20		A2
B	20		A3
	20		A4
C	20	B	B1
	20		B2
Test, Bug Fixing	20		B3
Project Mngt	<u>20</u>	C	C1
			C2
	100	T	Test, Bug Fixing
	Contingency (10%) 10	PM	Project Management
		NYA	Not allocated (20%) 20
		CT	Contingency (10%)
	<u>110</u>		<u>10</u>
			110



Cost Planning



- Detailed cost planning vs. Budget
- Work Packages as basis
- Use accounting/controlling classification

Project Number:	225	Project:	B2 Series	Project Manager:	John Murphy
WP-Number:	4.2.5	WP-Name:	Test Production Run	WP Responsibility:	Tom O'Dwyer
Cost Centre:	75				
Cost Classification	Resource	Number	Cost per Day	Total	
Personnel	Purchasing	2	500,00 €	1.000,00 €	
	O'Connor	10	375	3.750,00 €	
	Dunphy	15	425	6.375,00 €	
Equipment	Machinery			7.000,00 €	
	Tools			2.000,00 €	
Material	Production Material			500,00 €	
Travel	Subsistence	4	250	1.000,00 €	
			Total Costs	21.625,00 €	

Optimising the Plan



- Improve on completion date
- Optimise resource usage
- Juggle
 - Dates
 - Concentrate on (dynamic) Critical Path
 - Resources
 - Under utilised resources cost money, over utilised are less productive and/or sick
- Costs
 - Replace expensive resources with less expensive

Risk Analysis



- Life - and projects - is full of risk!
- Identify risks
- Financial, organisational and technical
- Use WBS to ask
 - What can possibly go wrong? (Murphy)
 - What assumptions may be incorrect?
 - How can risk be avoided?
 - What would be the effect?
 - How can effects be minimised?

Types of Risk



- **Financial Risk**
- Penalty clauses [Konventionalstrafen]
- Customer Insolvency
- Increased salaries
- Legal changes
- Increased supplier costs

Types of Risk



- **Financial Risk**
- **Organisational Risk**
 - Planning too optimistic
 - Loss / unavailability of staff
 - Badly defined requirements
 - Delays / overruns

Types of Risk



- **Financial Risk**
- **Organisational Risk**
- **Technical Risk**
 - New methods / processes
 - New products
 - New applications
 - New technologies
 - Equipment failures

Contact Information



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