IE 477/478 Systems Design: Analysis and Synthesis
Second Week: Essentials

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Course Coordinators

Yeşim Gülseren
University-Industry Collaboration
Student Projects Coordinator

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Teaching Assistants

25 September 2024

Course mission

System view

Factories, banks, restaurants, online shopping sites, airlines,

- *divide into parts:*
  inventories, production lines, manpower, orders, customers
- *study parts and their interrelations:*
  correlated demand, pull, push, precedence, starvation, wip, loss sales, risks
- synthesize:
  demand forecasts, basestock levels, production schedules, maintenance

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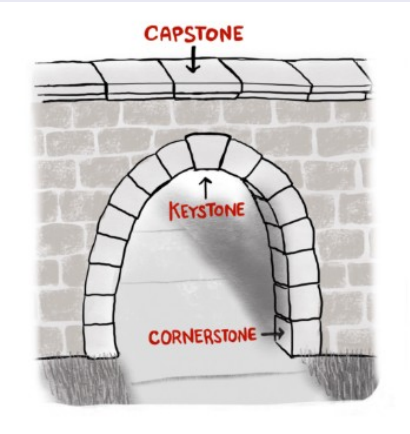
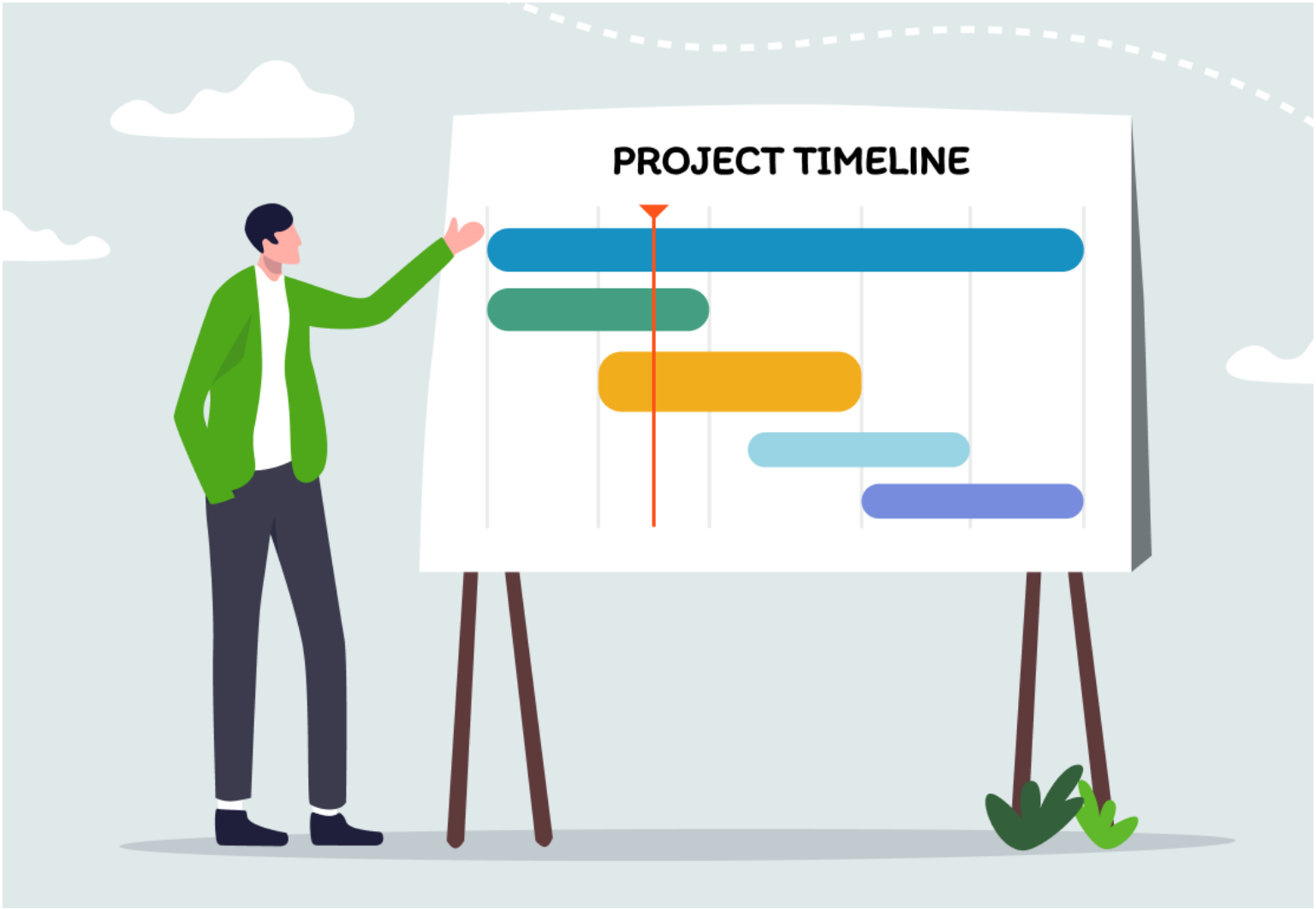
Capstone



Build a path/gate to solutions of problems

- Cornerstones: IE 303, IE 325 (modeling, optimization)
- Keystone: IE 375 (resource allocation of all kinds)
- Capstone: IE 477/478 (analysis and synthesis)

The whole is more than the sum of its parts.


PROJECT TIMELINE

Timeline

25
Sep
Wed
Today

Timeline

25 Sep Wed

Today

2 Oct Wed

22 Oct Tue

Timeline

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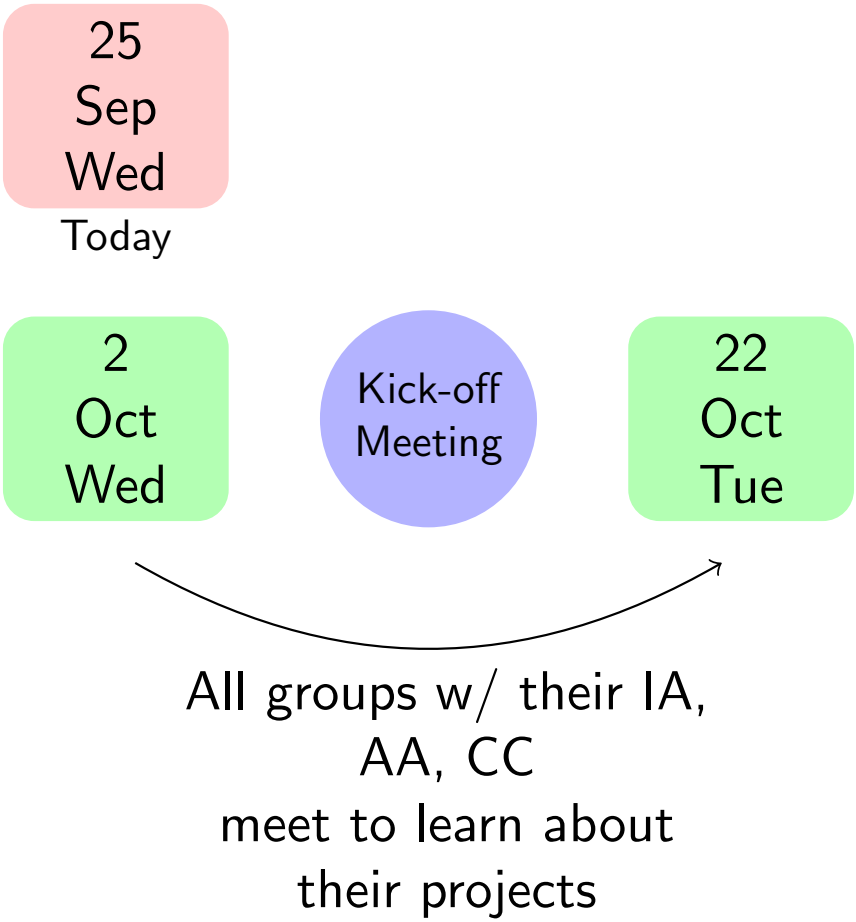
All groups w/ their IA, AA, CC
meet to learn about
their projects

Timeline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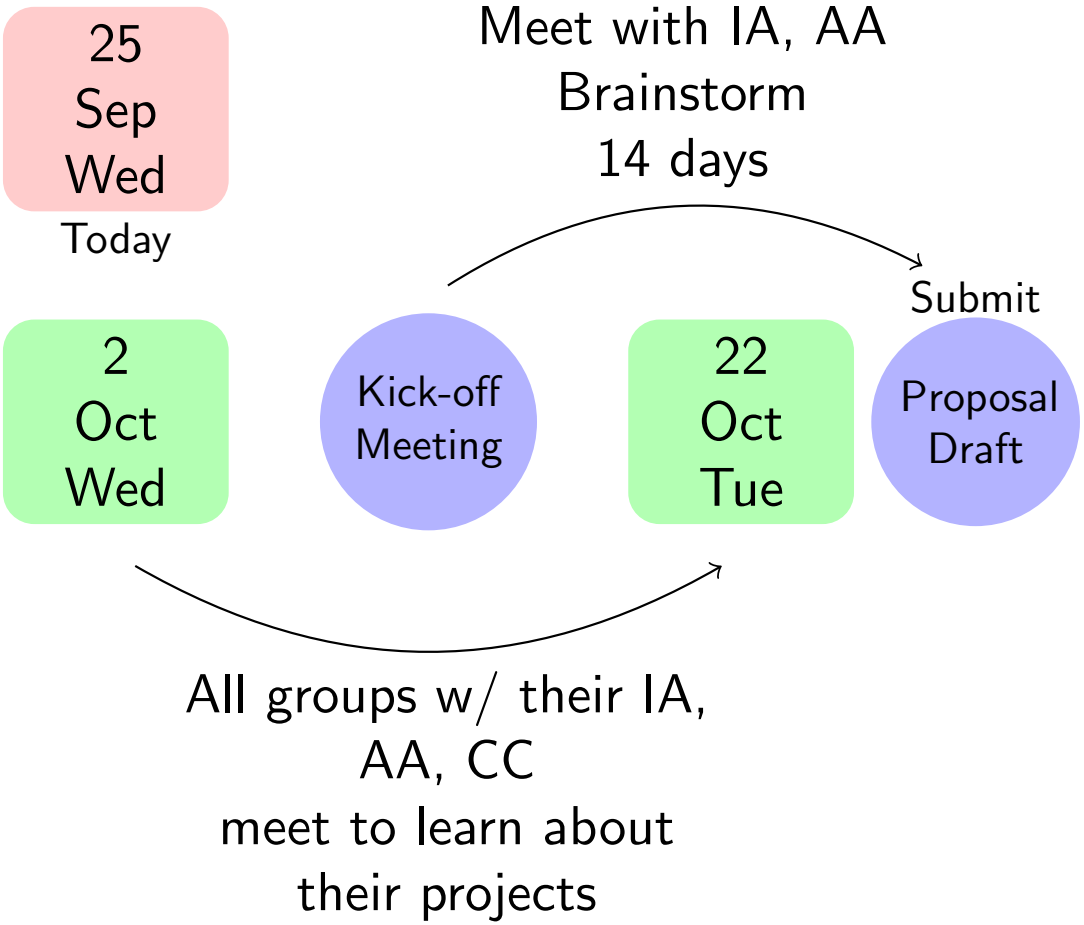
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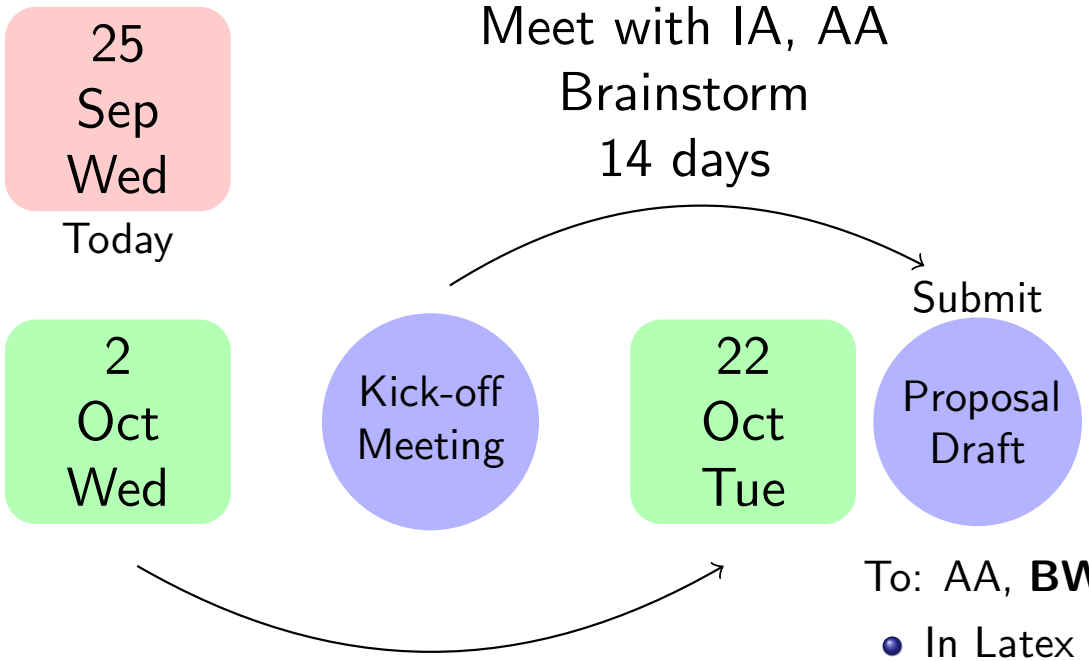

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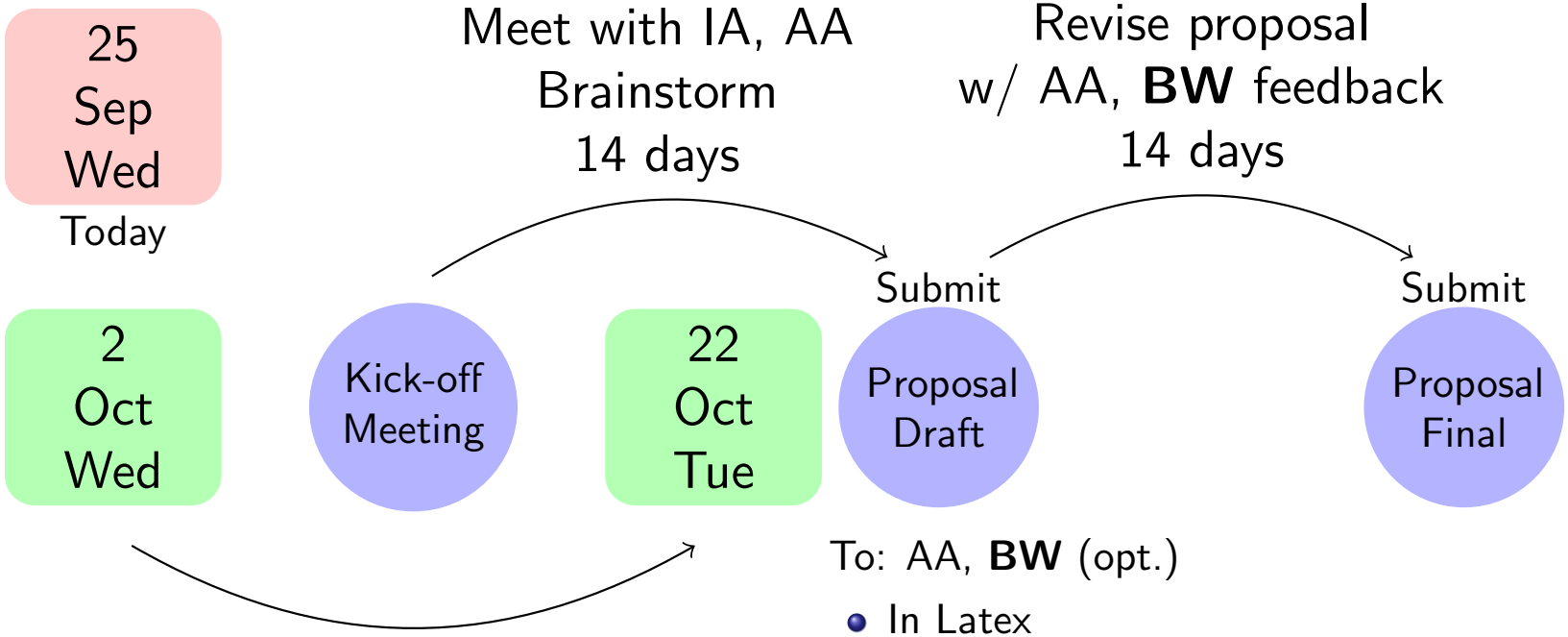

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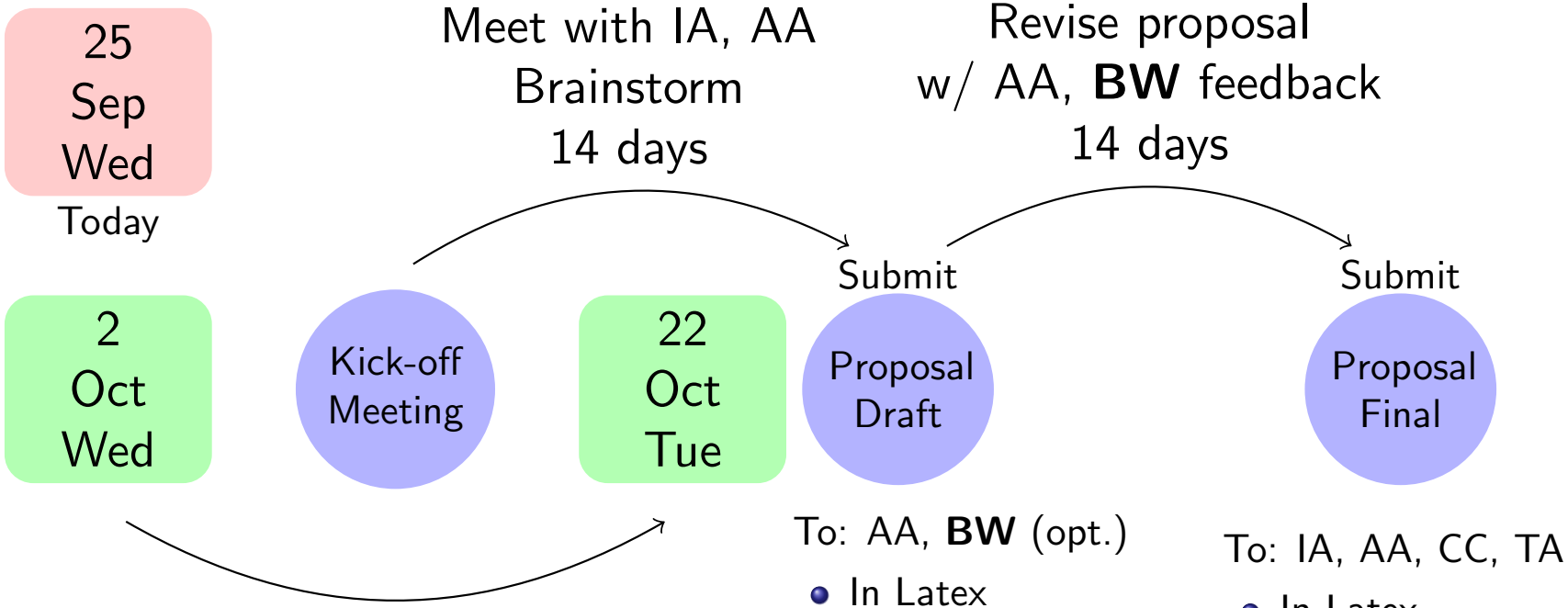

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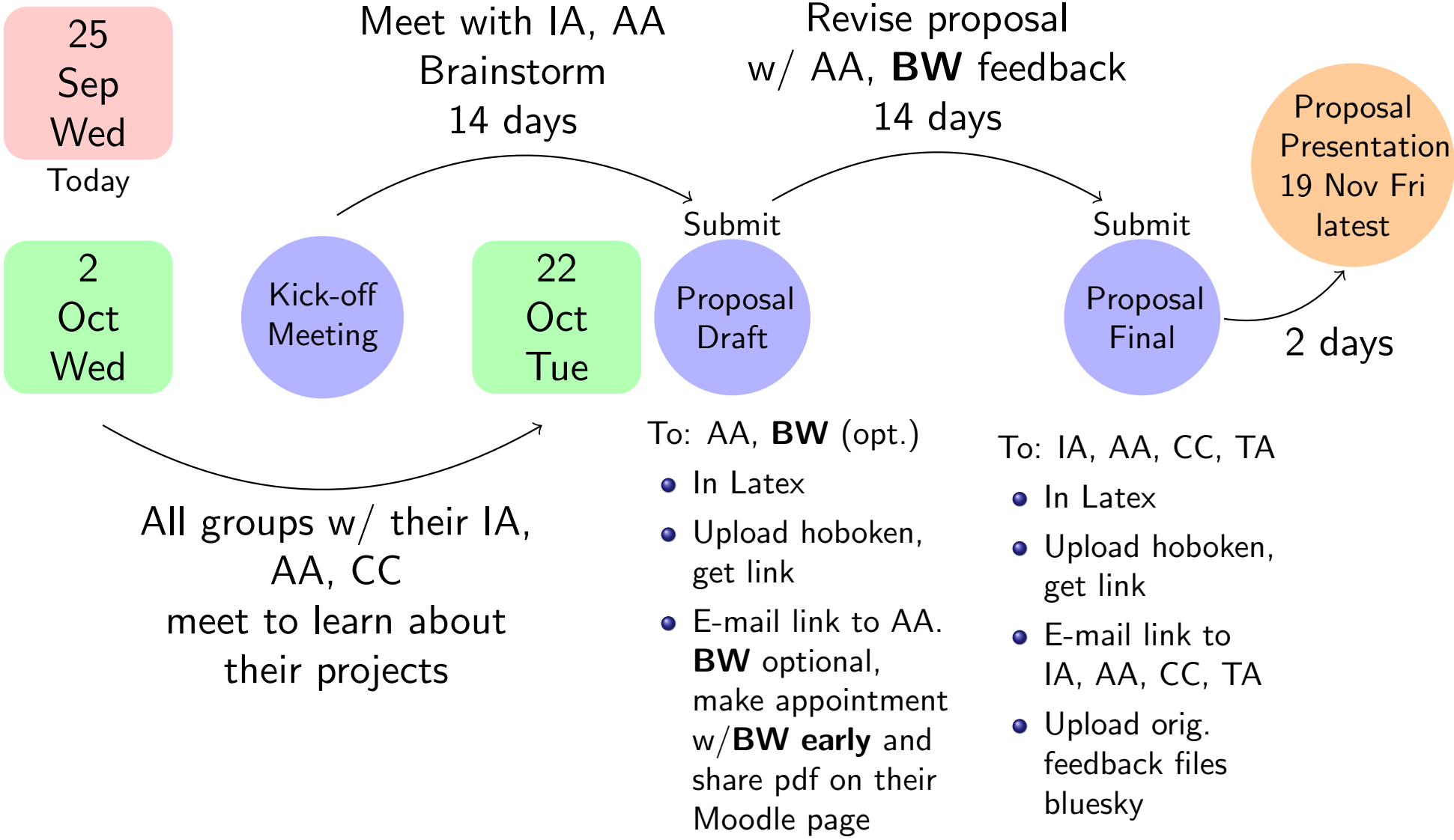
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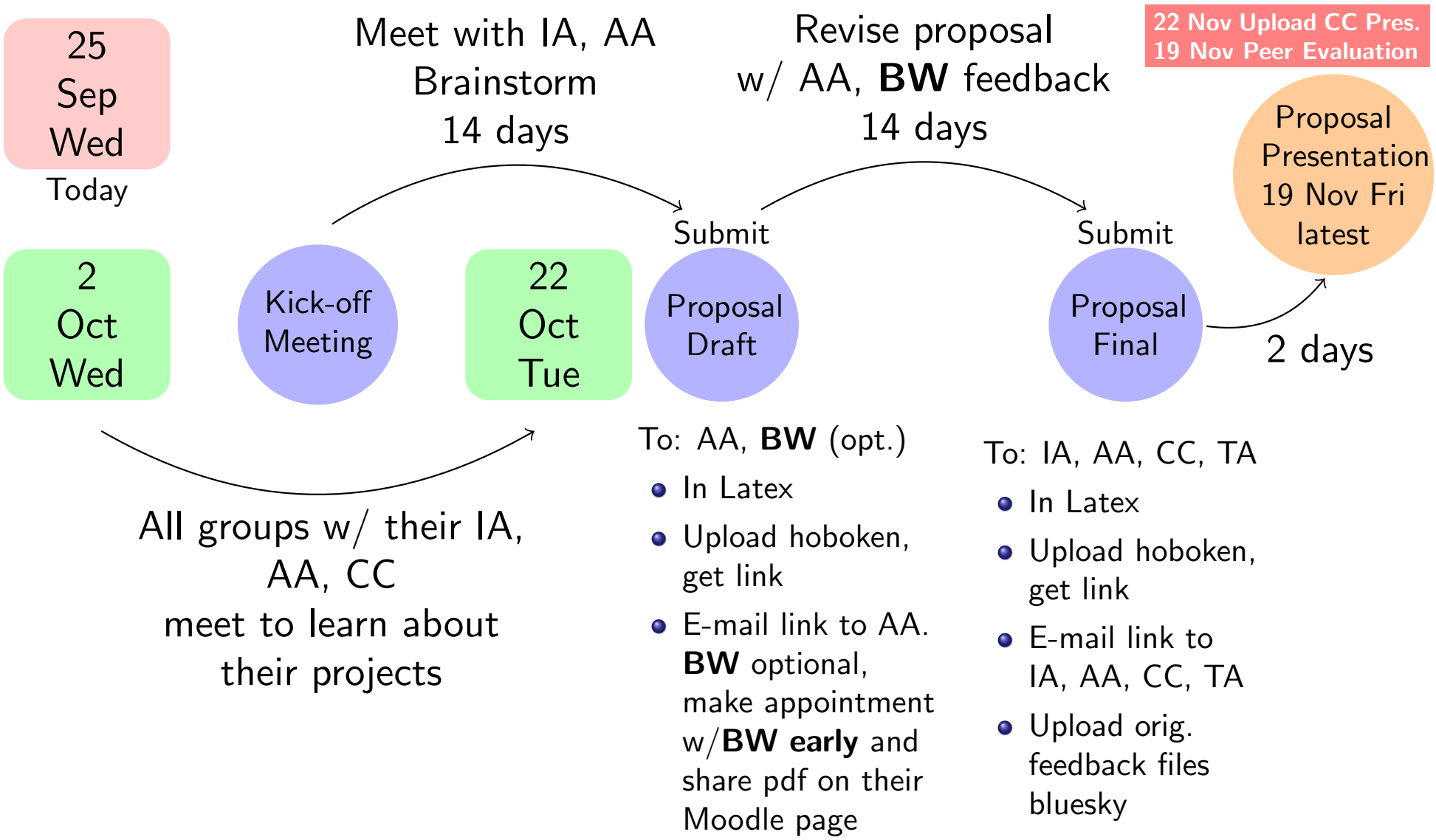
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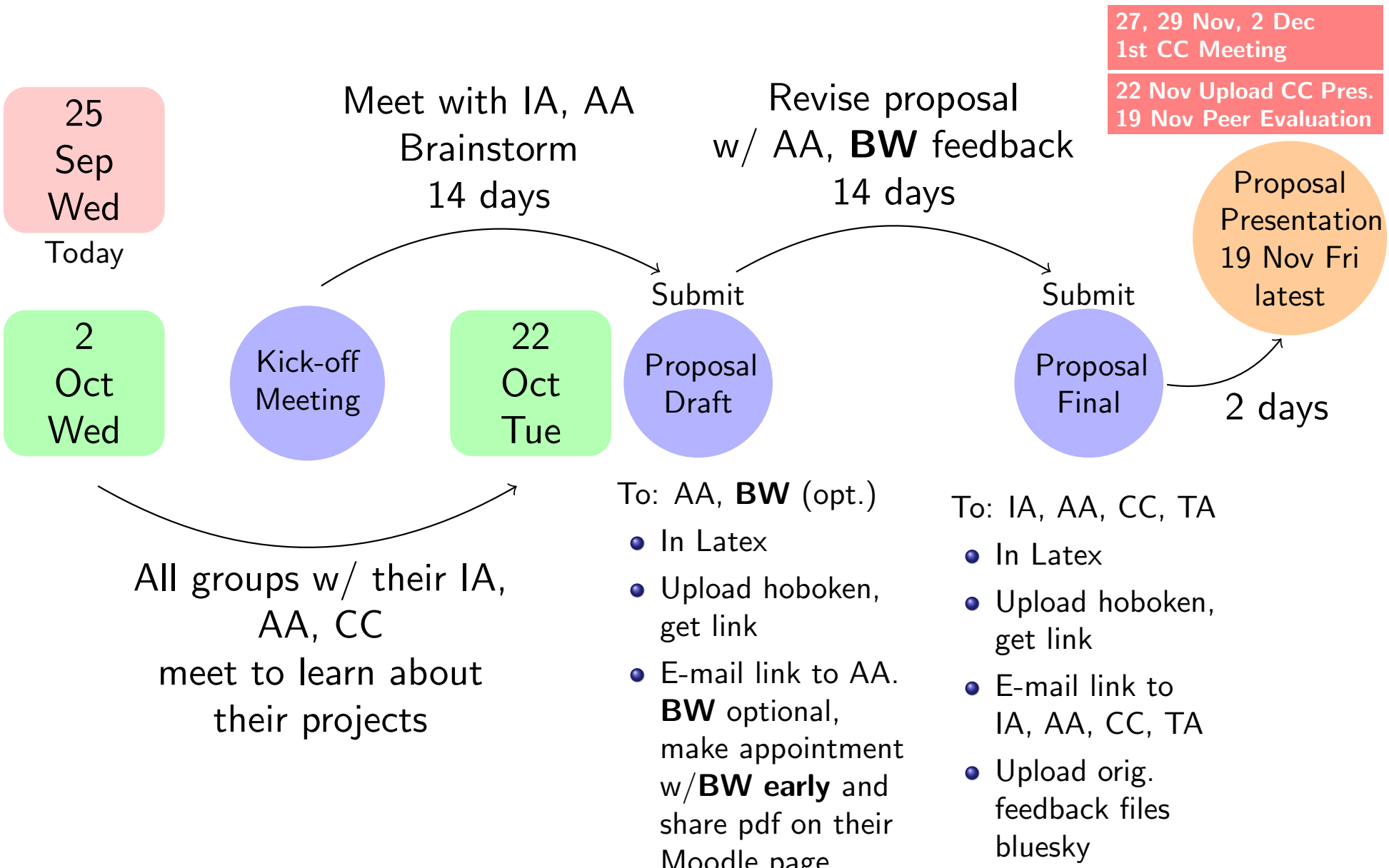
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    - timetable for when to start and finish
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- Agreeable by IA, AA, CC, the group
  - meet regularly with IA and AA
  - keep minutes of the meeting:
    - what are new actions to be taken?
    - who is responsible for each task?
    - use project management system on bluesky

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  - modeling, LP, production planning, scheduling,
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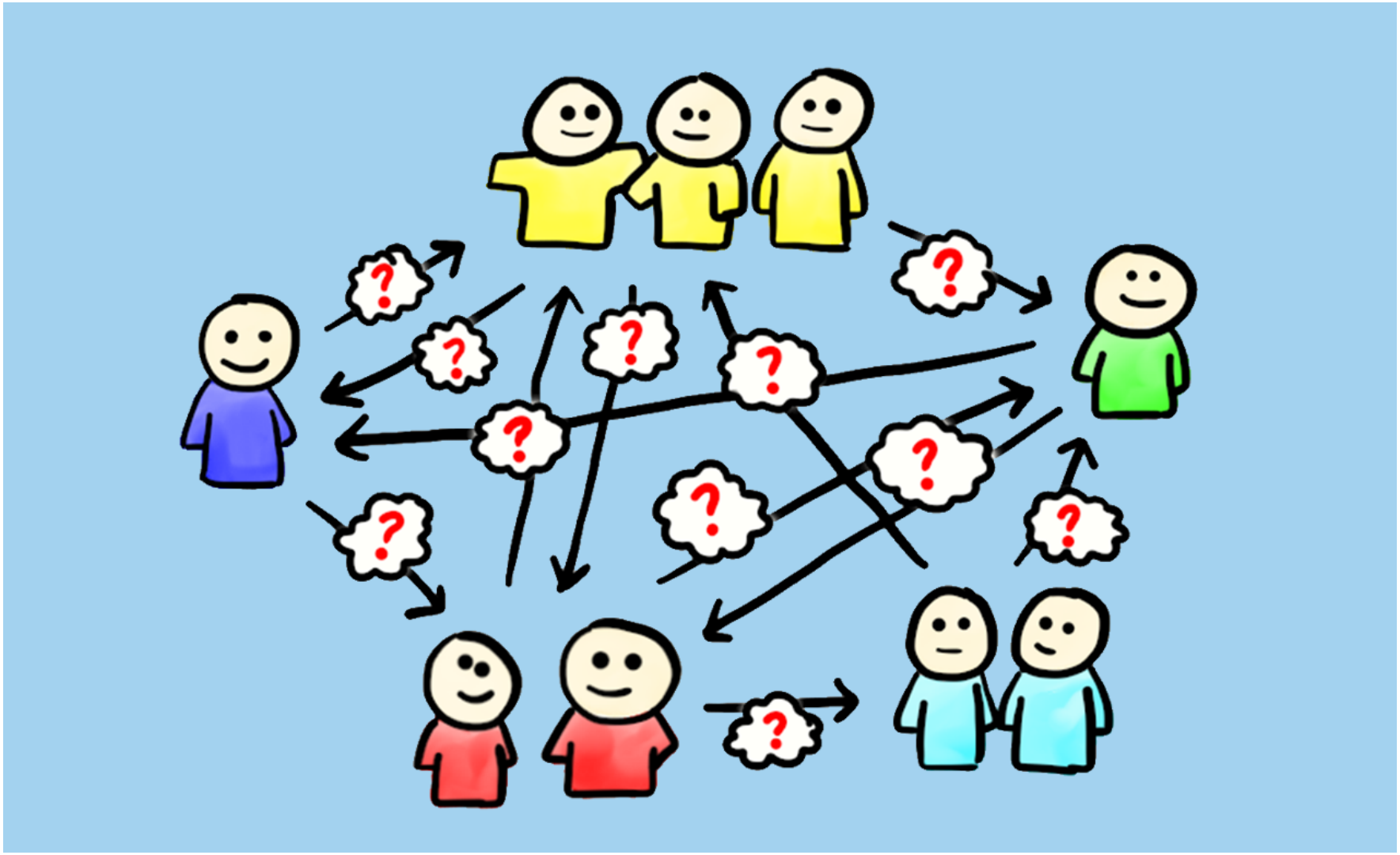
- Critical thinking
  - can the real problem be different than what company described?
  - where are the bottlenecks?
  - can there be a solution approach better than what IA, AA, CC may suggest?
  - are the assumptions realistic?
  - are all of important constraints stated?
  - can you solve LP, MIP in acceptable time? do you need a heuristic?



?? Roles and Expectations ??

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- busy – go prepared with qtns
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CP:
- always available accessible
- punctual in passing messages
- kind

We can dismiss CP if s/he does

Roles and expectations, continued

Yeşim Gülseren
University-Indusry Collaboration
Student Projects Coordinator

- Seeking projects from companies
- Communication with industrial advisors
- Overseeing project budgets and ensuring their proper use
- Enforcement of non-disclosure agreements
- Organizing course seminars (e.g., project management, teamwork)
- Approval of legitimate project budget spending requests
- Mentoring students on patent appllications and entrepreneurship
- Guidance for students to apply for TUBITAK student grants
- Support for project fair organization
- Career advise for students after graduation

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  - plot 101 series
  - are they alike?

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Benchmarking

- performance measure
  - fill rate
  - cost/profit
  - multiple?
- compare proposed & current system
- how? simulation? pilot study

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- contains major constraints, factors, interactions, tradeoffs
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Fall semester: get ready for 2nd CC meeting on 9-10 Jan 2025

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Benchmarking

- performance measure
  - fill rate
  - cost/profit
  - multiple?
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- May 1st Week: DELIVERY

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Rest of May: reports, CC meetings, fair

Expectations

By the end of Fall semester, we expect to see a solution method

- **scalable to the actual size** of the problem faced
  - scalable in input size
    - number of products
    - number of machines
    - number of planning periods, etc.
  - scalable in running time
    - $<$ 30 minutes for what-if analysis
    - $<$ over-night for weekly planning
    - $<$ a day for monthly planning
  - check the requirements with the IA.
- implemetable using only **open source tools**
  - companies cannot afford, e.g., CPLEX, Gurobi
  - academic / student licenses are not allowed in the final product
- gone through **well documented verification process**

The details must be in the **first progress report due 24 Dec 2024**. Should be presented in **9-10 Jan 2025 CC meetings** (video ready on Jan 3rd, 2025).

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- before writing proposal report go to course homepage and read
  - IE 477 – General Tips on Writing Reports (1 page)
  - IE 477 – Suggested Contents for Proposal Report (3 pages)

  For the upcoming reports (first progress report in fall, second progress, final, and booklet reports in spring) go to Information on Reports page.

Presentations

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  - Progress presentation: changes, verification, validation, benchmarking
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- Read online
  - General Tips on Presentations and Meetings
  - Information on Preparing Presentation Video

Follow the roadmap on course page

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  - Use project management system
    - Send iCal invitations for new meetings
    - Before: write agenda, share it, ask invitees for additions of new agenda items
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- do not forget to fill the peer evaluation forms. If you fail, then your grade will be lower.


DATA

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- no-disclosure agreements (NDA) take time to process:
  - finalize agreement content (Yeşim Hanım)
  - sign in person
  - send to company in mail (not enough to email scanned copies)
  - company signs at its own time of convenience – can take long time on its own.

  Start right after kick-off meeting.

PROJECTS

Received 24 projects.

Rank them all with no ties.

Submit preferences by 17:30 today.

Projects

- Arçelik/Beko (3), Ata Teknoloji, Bakioğlu, Emeklilik Gözetim, EnerjiSA, Meteksan Savunma, Nesco, Nestle (2), Ortadoğu Rulman Sanayi, Supply Chain Wizards, Tepe Betopan, Tepe Mobilya, Unilever
  - Inventory management
  - Production planning
  - Route planning
  - Scheduling
  - Forecasting
  - Process improvement
- New companies
  - Epam Systems Turkey Yazılım Geliştirme Limited Şirketi / Ankara
    - help e-commerce clients increase their online sales
    - data science project
  - Hayat Finans / İstanbul
    - manpower scheduling, customer satisfaction
    - call center management
  - Memorial Sağlık Grubu / İstanbul
    - health care / hospital management
    - manpower planning, scheduling

Projects continued

- New companies continued
  - Nevzat Ecza Deposu / Ankara
    - run by former Bilkenters
    - coordination of shipments between eight storage facilities
    - inventory management
  - İgsaş - İstanbul Gübre Sanayii A.Ş. / Kocaeli
    - fertilizer production
    - seven storage aareas across Turkey
    - production and inventory planning
  - Pegasus Airlines / İstanbul
    - flight scheduling
  - Sports International / Ankara
    - marketing with data science
    - increase customer loyalty, reduce customer churn rate