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Digital Transformation

 **Cassa Centrale Banca**
Gruppo Bancario

Blockchain-based Invoice Factoring: from Business Requirements to Commitments

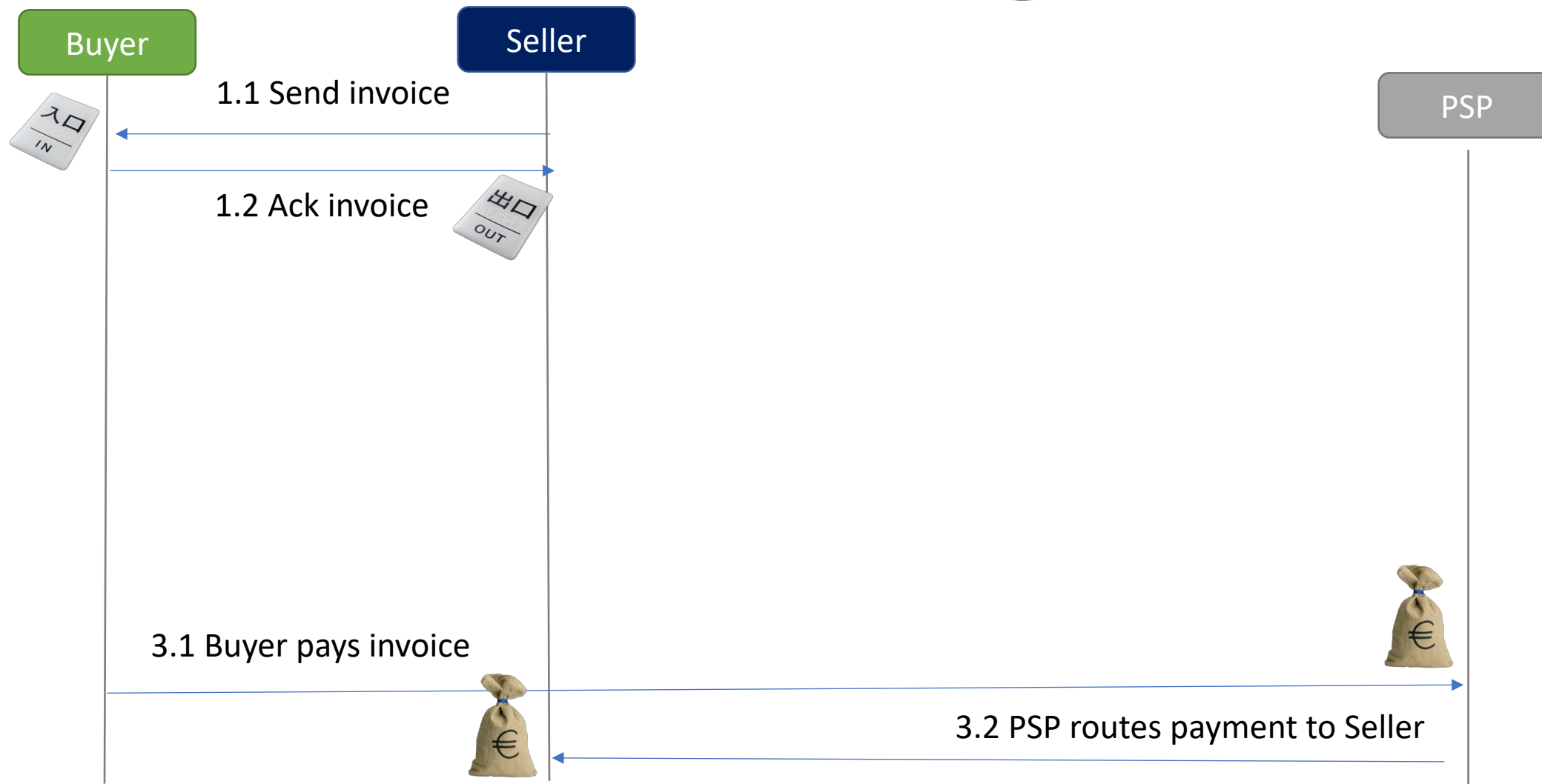
Fabio Massacci

Joint work with Ettore Battaiola, Chan Nam Ngo and Pierantonio Sterlini

What happens when you send a bill to a company?



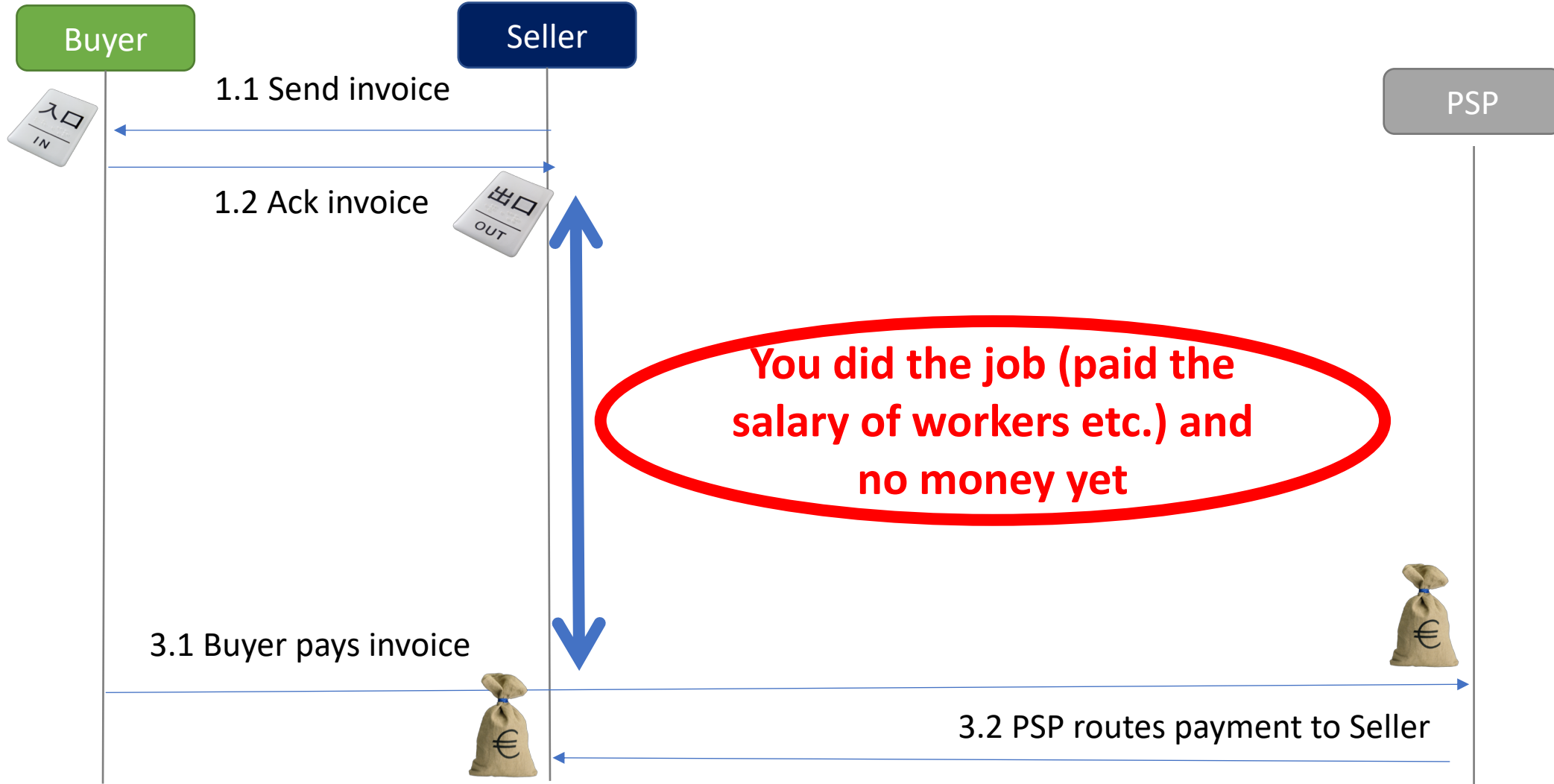
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It happens that you are in the s....



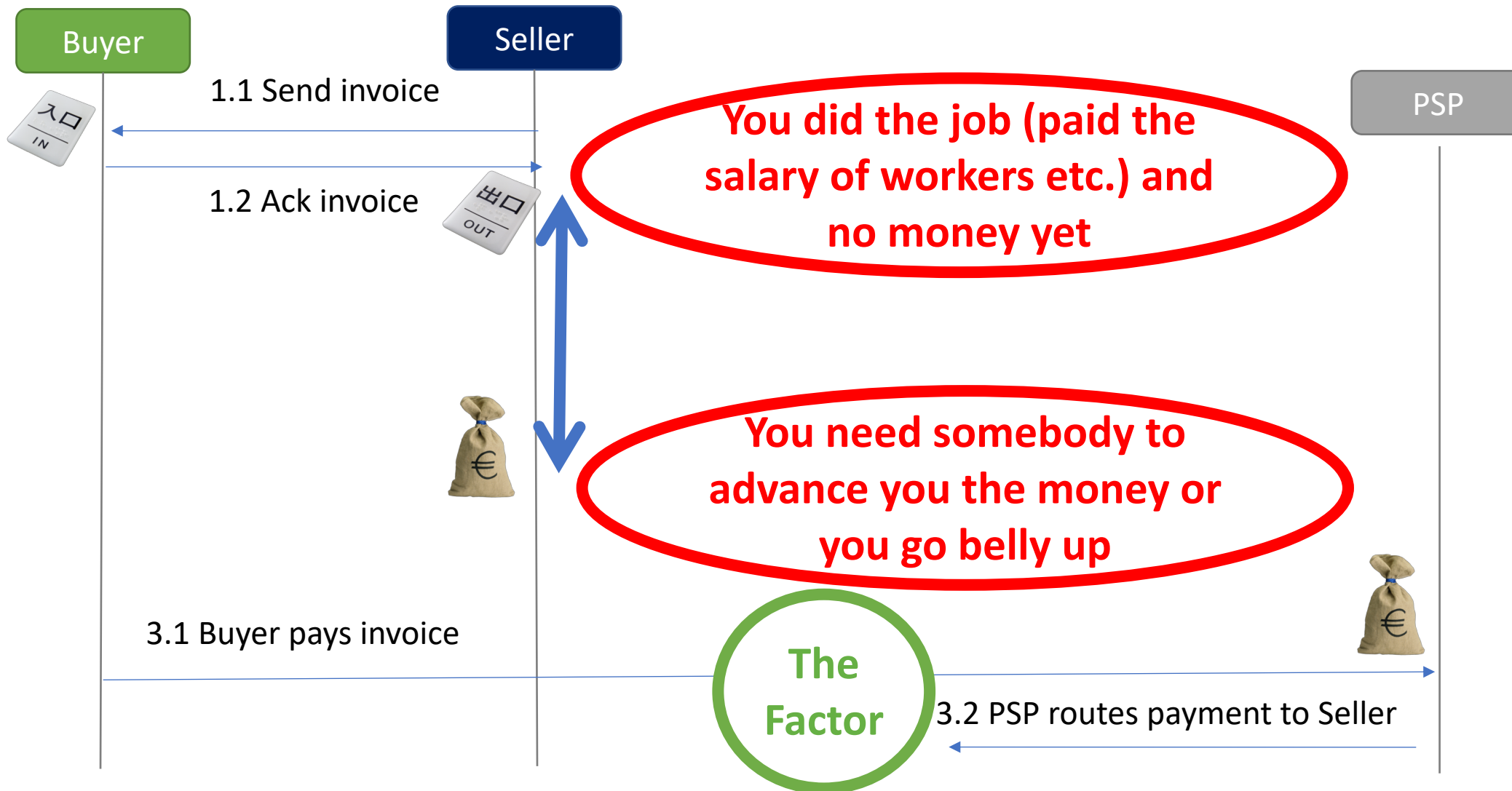
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You need help...



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EU factoring market (turnover) is 1.26 Trillions Euro in 2017

Country	Factoring market size '17 (in bln)	Average payment term '17	Percentage of sales made on credit '17	Average 'Days Sales outstanding' (DSO) '17	GDP penetration '16	Contribution of SMEs to Value added at factor costs '16
United kingdom	€326.9	23 days	45.7%	31 days	13.8%	51.8%
France	€268.2	34 days	29.3%	42 days	12.10%	54.5%
Germany	€216.9	24 days	26.5%	25 days	6.9%	54.1%
Italy	€208.6	50 days	42.5%	85 days	12.5%	67.7%
Spain	€130.7	45 days	37.8%	47 days	8.7%	61.8%
Netherlands	€82.8	24 days	35.0%	41 days	11.9%	62.9%
Europe tot/average	€1256.7	31 days	38.8%	44 days	-	

Source: FCI annual review '17, EUF 2016, Atradius payment practice barometer 2017, Eurostat 2016



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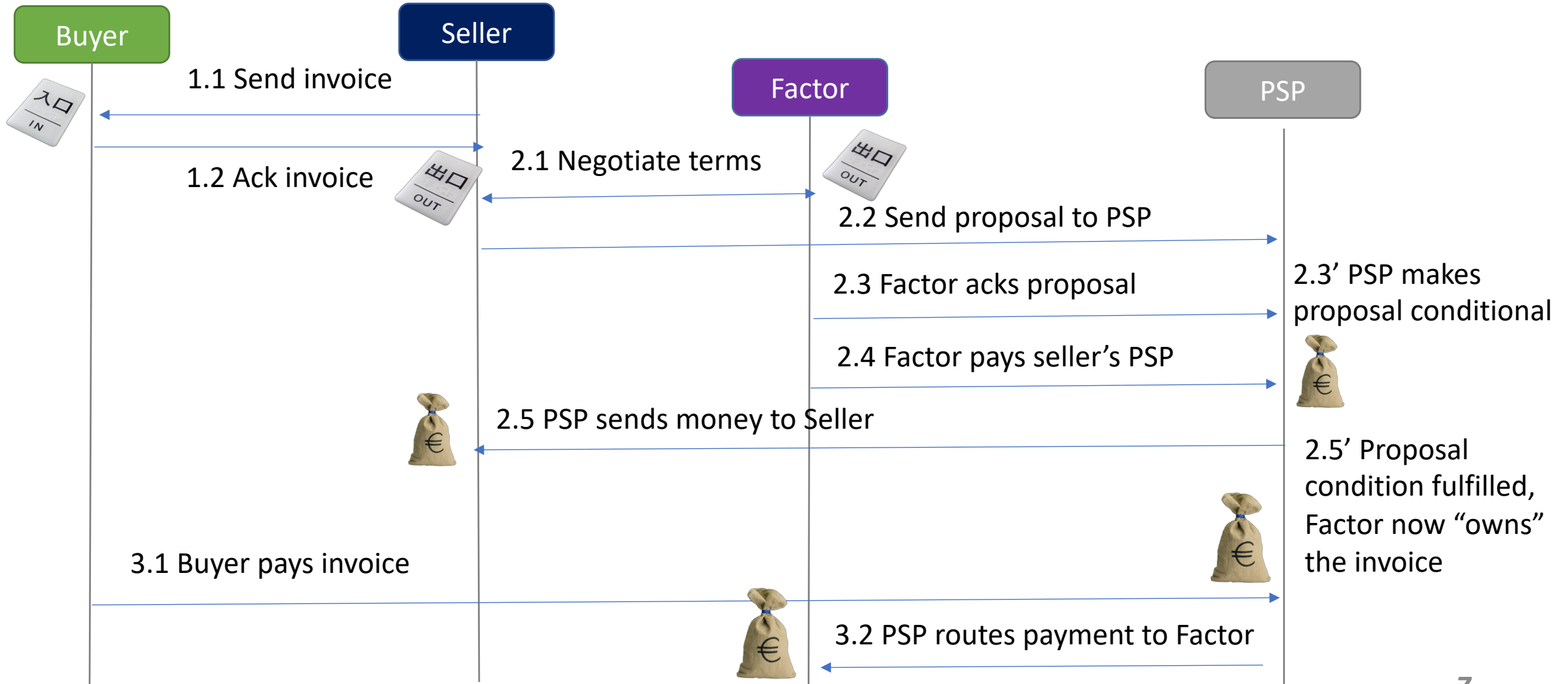
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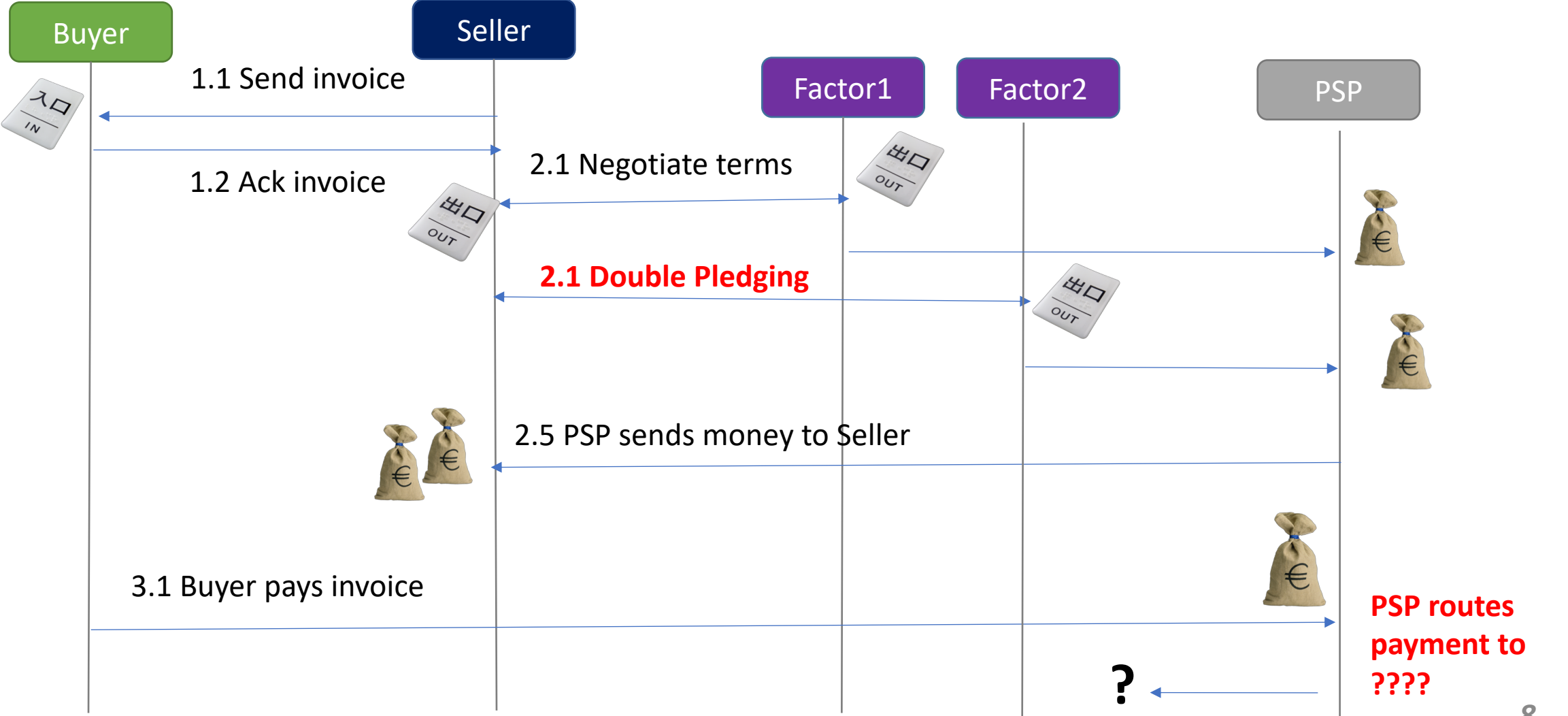
High-level actors & interactions



High-level actors & interactions



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The head of the business is served by risk-based assessment methods

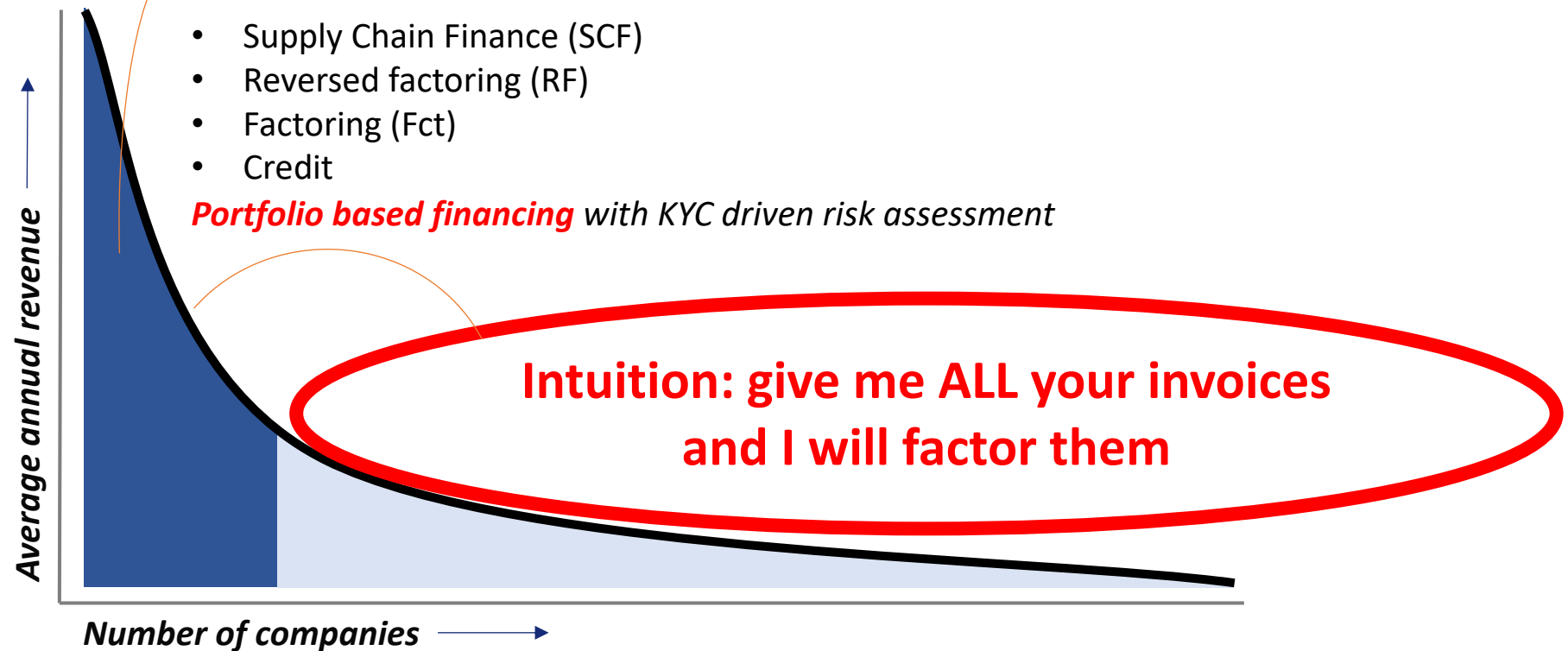


Focus of today's receivables financing market

Several receivables financing options available:

- Supply Chain Finance (SCF)
- Reversed factoring (RF)
- Factoring (Fct)
- Credit

Portfolio based financing with KYC driven risk assessment



The long tail of businesses is underserved due to current profile based risk assessment methods



UNBIAS ecosystem and needs



Seller

- **Better access to financing options**
- **Receive better finance offerings**
- Better cash flow predictability

Buyer

- Reduce effort of credit insurance requests
- Maintain in control of creditor portfolio, also after removal factoring ban
- Certainty of settling invoices

UNBIAS

Joint EIT project
of UNITN and InnoPay NL

Factor

- **Solution to prevent double factoring of invoices**
- **Trusted invoice information for risk assessment**

Maintain individual competitive advantage

Credit insurer

- Trusted information for risk assessment, including invoice, seller and buyer information

Payment service provider (PSP)

- Trusted for payments by all parties
- PSP connects factors, buyers and sellers to the UNBIAS platform

Ideal functionality: centralized invoice factoring



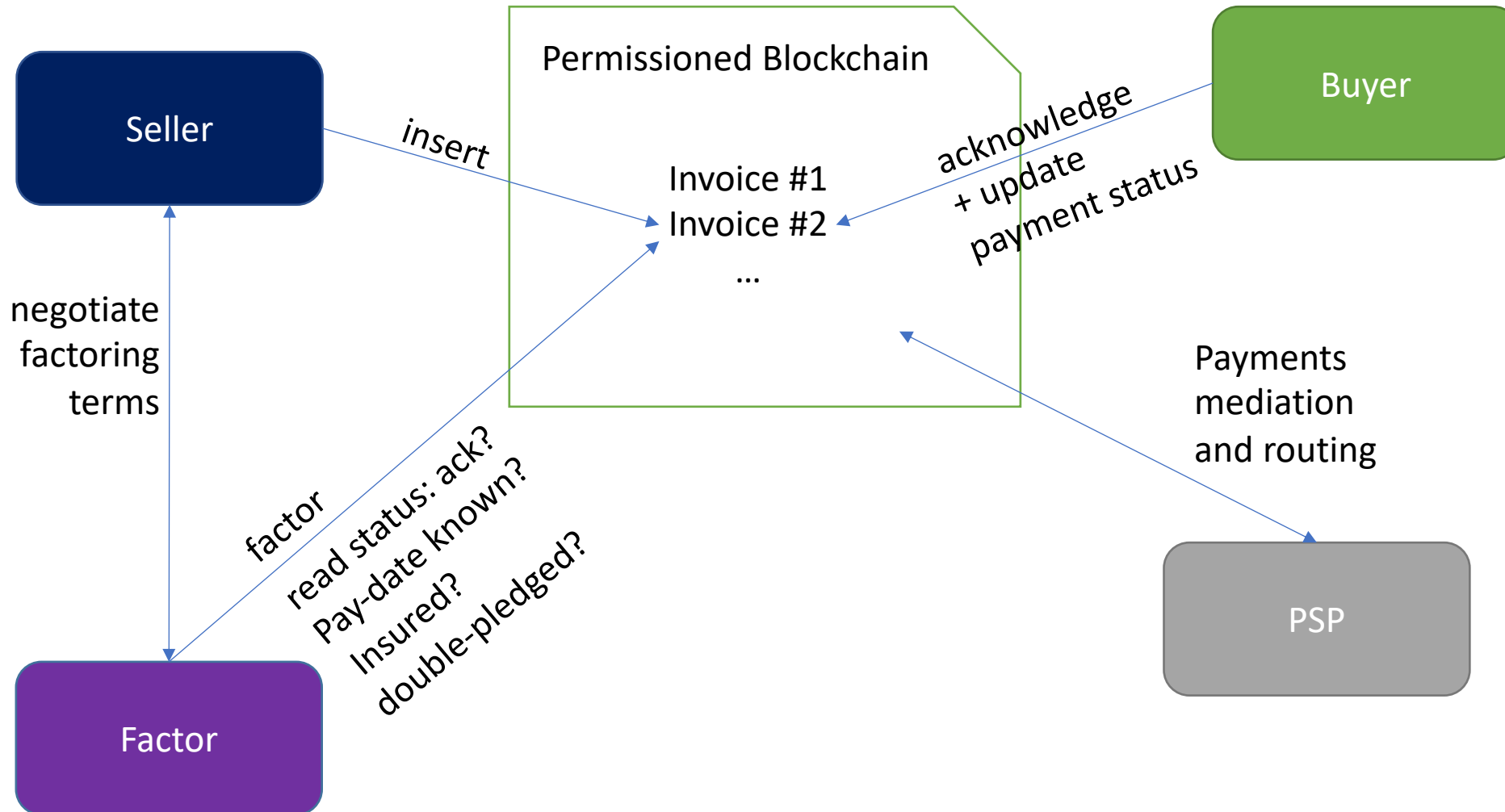
- Assume there is a central server for all parties to send and receive data
 - **Important: today it does not exist → nobody wants to share the data**
- Our task is to make the distributed system security indistinguishable from the ideal functionality
 - **Uniqueness of invoices while preserving confidentiality of their details**
- Data:
 - Invoices and Payments
- Party types
 - Buyer, Seller, Insurer, Factorer
 - Payment Service Provider (PSP)

More Security Requirements

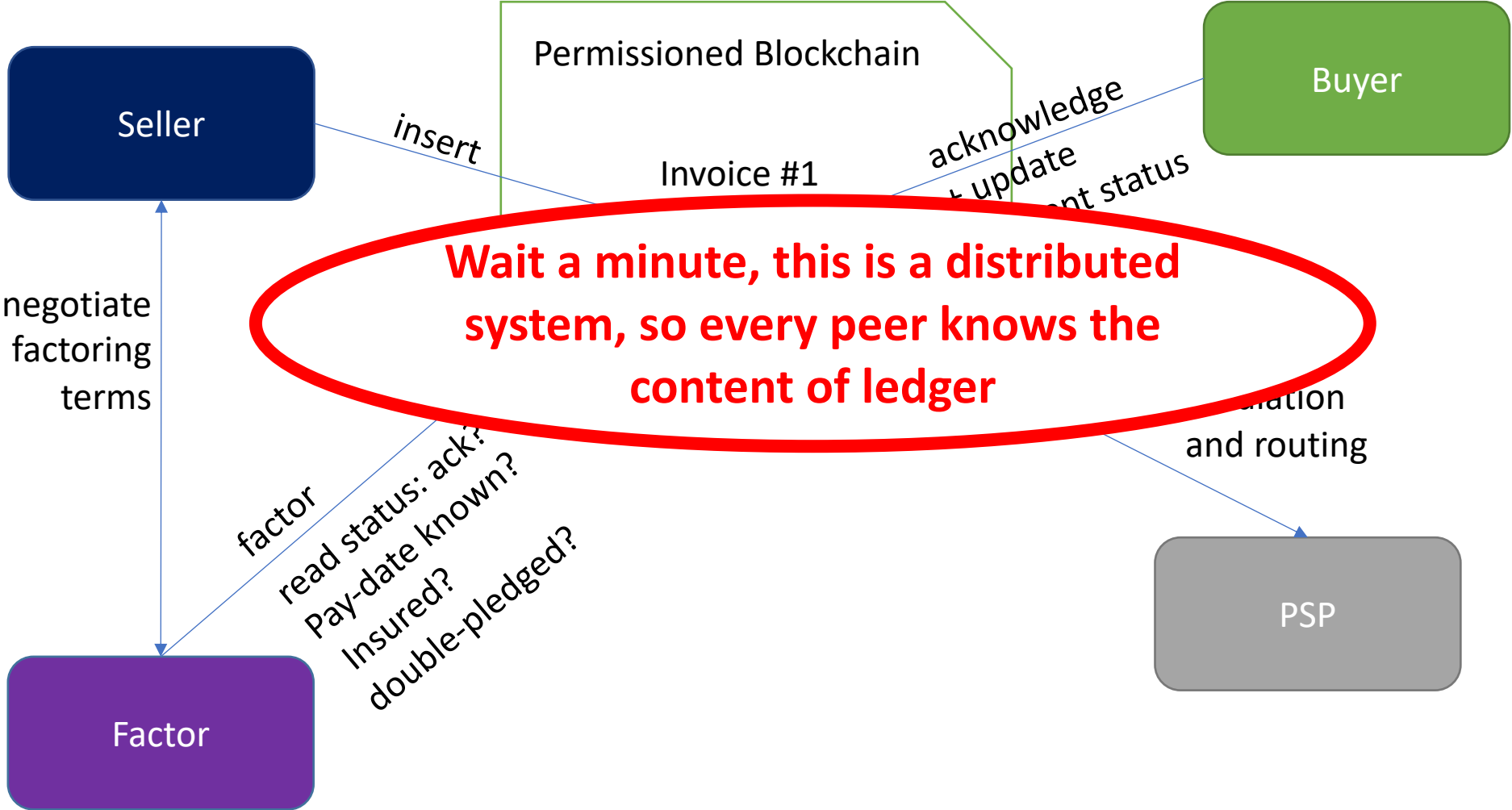


- Actors are recognizable
 - TOR is expensive
 - And looks fishy
- First level requirements
 - Actions are undistinguishable
 - Data is confidential
 - Data preserves integrity
 - No double pledging, etc.
 - Data maintains unlinkability
- Second level requirements
 - Only certain actors are able to do something
 - “Yellow Pages” (certificate scheme) for VAT owners, IBAN owners, PSPs
 - Join/Leave the Yellow Pages
 - Is there a national ID/certification scheme?

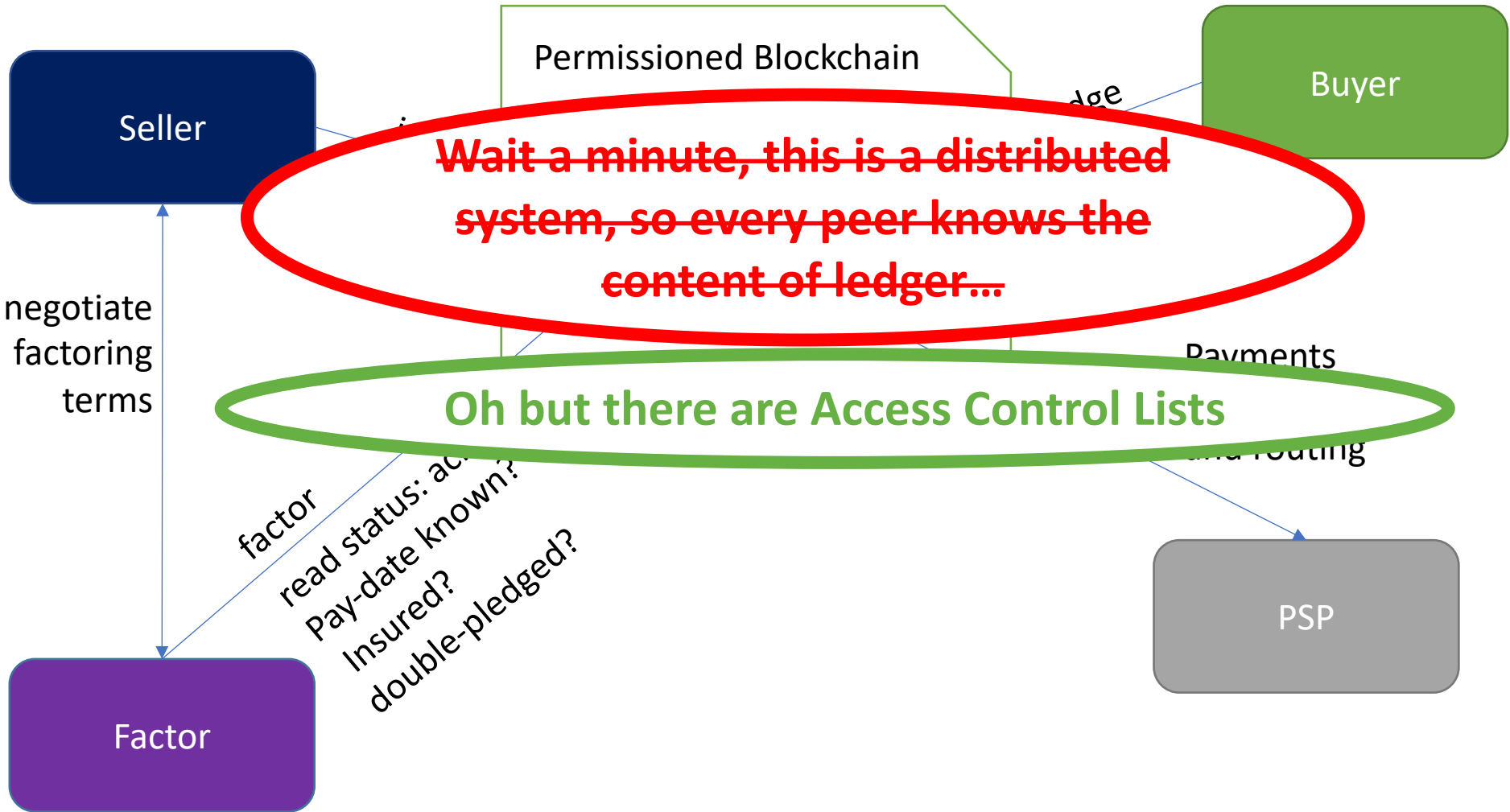
UNBIAS Baseline: Permissioned blockchain solution



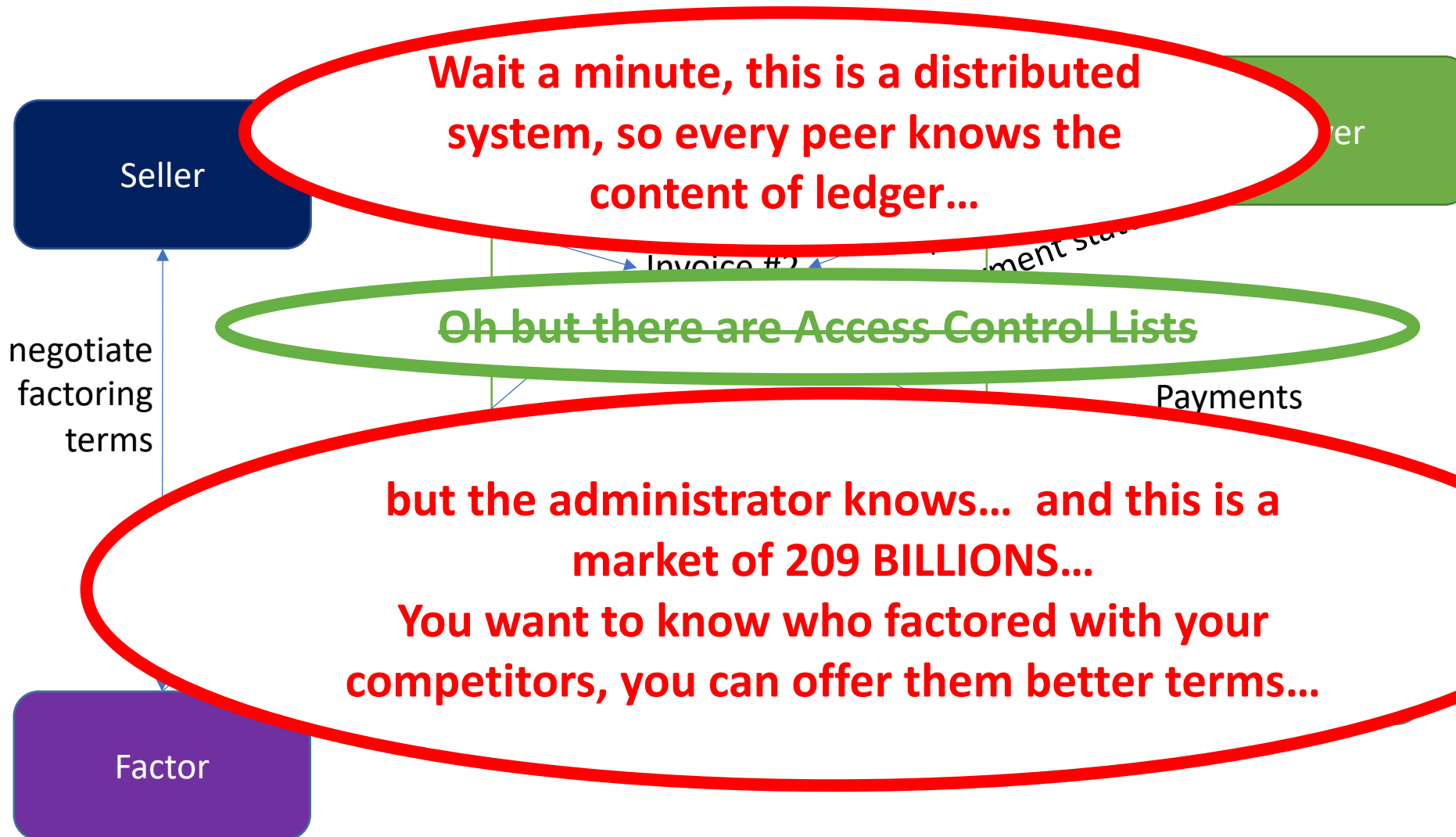
UNBIAS Baseline: Permissioned blockchain solution



UNBIAS Baseline: Permissioned blockchain solution



UNBIAS Baseline: Permissioned blockchain solution



Wait a minute, this is a distributed system, so every peer knows the content of ledger...

Oh but there are Access Control Lists

but the administrator knows... and this is a market of 209 BILLIONS...
You want to know who factored with your competitors, you can offer them better terms...

UNBIAS Solution: Hash-based solution for privacy



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Secret data is shared between involved parties to ensure consistency with the public ledger

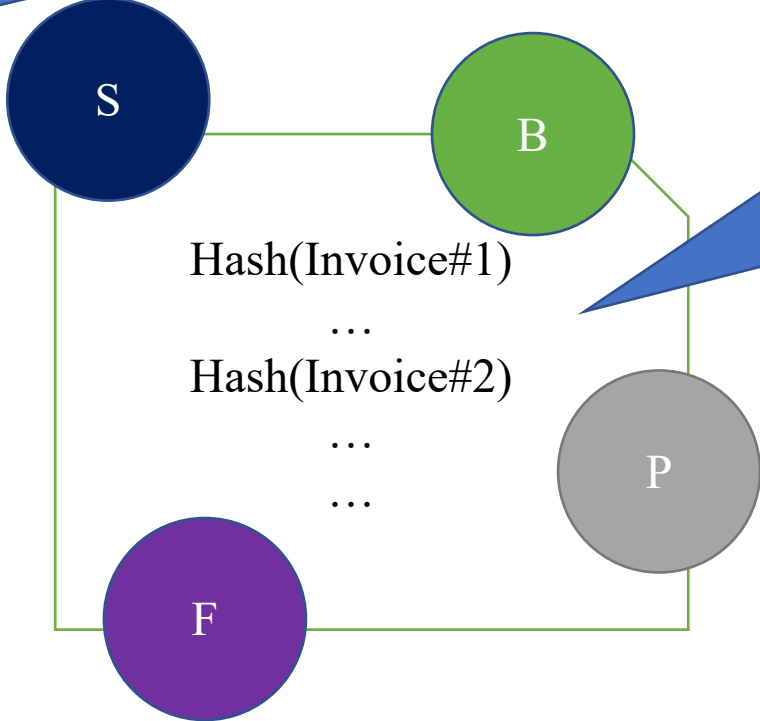
Seller

Secret Data:
Invoices, etc.

Buyer

Secret Data:
Invoices, etc.

Distributed Ledger for public data, only hashes, maintained by all/major participants



Factor

Secret Data:
Proposals, etc.

Secret Data:
Routing table, etc.

PSP

UNBIAS Development



- HyperLedger (Java) <https://www.hyperledger.org>
 - Customizable blockchain code
 - PBFT mode for consensus
- General crypto libs: OpenSSH, or just code snippets from major cryptocurrency code base
- Java Native Interface
 - Integration between blockchain and the crypto lib

Challenges beyond UNBIAS



- “Yellow Pages” for Players ID Management (bootstrap of the parties)
 - New initiatives of electronic invoicing creates identities but no solutions against double pledging...
- Con-currency in invoice status updates
 - E.g. Buyer pays the invoice and the Factorer pays the same invoice at the same time
- Compliance with PSD2
 - Sharing data between banks of the same party may require dynamic changes to invoice data access control
- Aborts and non-cooperation
 - Normally solved as penalty, financially or reputation-wise
- Next step replace hashes with zero-knowledge proofs
 - Libsnark <https://github.com/scipr-lab/libsnark>
 - Bootstrap the Common Reference String for libsnark

Interested in joint projects?



- “Blockchain & security/crypto economics?”
 - Fabio Massacci → fabio.massacci@unitn.it
 - Chan Nam Ngo → channam.ngo@unitn.it
 - <https://securitylab.disi.unitn.it/>
 - Watch this space for our work on **Futures Exchange** (IEEE S&P 2018)
- Blockchain & distributed protocols
 - Alberto Montresor → alberto.montresor@unitn.it
 - <http://cricca.disi.unitn.it>
- Or come to visit us.
- Possibly joint company project within EIT Digital Finance Action Line