Complexity of DLs

Complexity of DLs: Overview of the Complexity of Concept Consistency

P	(co-)NP	PSpace	ExpTime	NExpTime
		$\mathcal{ALCN}$ (wrt acyc. TBoxes)		

$\mathcal{I}$ inverse roles: h-child$^-$

$\mathcal{N}$ NRs: $(\geq n$ h-child$)$

$\mathcal{Q}$ Qual. NRs: $(\geq n$ h-child Blond$)$

$\mathcal{O}$ nominals: "John" is a concept

$\mathcal{F}$ feature chain (dis)agreement

$\cdot_{R^+}$ declare roles as transitive

$\cdot^{\neg,\cap,\cup}$ Boolean ops on roles

Complexity of DLs: Overview of the Complexity of Concept Consistency

P	(co-)NP	PSpace	ExpTime	NExpTime
	$\mathcal{ALUN}$ (NP) without $\exists$, only $\neg A$	$\mathcal{ALCN}$ (wrt acyc. TBoxes)		

$\mathcal{I}$ inverse roles: h-child$^-$

$\mathcal{N}$ NRs: $(\geq n$ h-child$)$

$\mathcal{Q}$ Qual. NRs: $(\geq n$ h-child Blond$)$

$\mathcal{O}$ nominals: "John" is a concept

$\mathcal{F}$ feature chain (dis)agreement

$\cdot_{R^+}$ declare roles as transitive

$\cdot^{\neg,\cap,\cup}$ Boolean ops on roles

Complexity of DLs: Overview of the Complexity of Concept Consistency

P	(co-)NP	PSpace	ExpTime	NExpTime

$\mathcal{ALCN}$ (wrt acyc. TBoxes) → $\mathcal{ALUN}$ (NP) without $\exists$, only $\neg A$ → $\mathcal{ALN}$ without $\sqcup$

$\mathcal{I}$ inverse roles: h-child$^-$

$\mathcal{N}$ NRs: $(\geq n$ h-child$)$

$\mathcal{Q}$ Qual. NRs: $(\geq n$ h-child Blond$)$

$\mathcal{O}$ nominals: "John" is a concept

$\mathcal{F}$ feature chain (dis)agreement

$\cdot_{R^+}$ declare roles as transitive

$\cdot^{\neg,\cap,\cup}$ Boolean ops on roles

Complexity of DLs: Overview of the Complexity of Concept Consistency

P	(co-)NP	PSpace	ExpTime	NExpTime

$\mathcal{ALCN}$ (wrt acyc. TBoxes)

$\mathcal{ALUN}$ (NP) without $\exists$, only $\neg A$

$\mathcal{ALN}$ without $\sqcup$

$\mathcal{ALE}$ (co-NP) without $\sqcup$ and NRs, only $\neg A$

$\mathcal{I}$ inverse roles: h-child$^-$

$\mathcal{N}$ NRs: $(\geq n$ h-child$)$

$\mathcal{Q}$ Qual. NRs: $(\geq n$ h-child Blond$)$

$\mathcal{O}$ nominals: "John" is a concept

$\mathcal{F}$ feature chain (dis)agreement

$\cdot_{R^+}$ declare roles as transitive

$\cdot^{\neg,\cap,\cup}$ Boolean ops on roles

Complexity of DLs: Overview of the Complexity of Concept Consistency

P	(co-)NP	PSpace	ExpTime	NExpTime
$\mathcal{ALN}$ without $\sqcup$ subsumption of $\mathcal{FL}_0$ $\sqcap$ and $\forall$ only	$\mathcal{ALUN}$ (NP) without $\exists$, only $\neg A$ $\mathcal{ALE}$ (co-NP) without $\sqcup$ and NRs, only $\neg A$	$\mathcal{ALCN}$ (wrt acyc. TBoxes)		

$\mathcal{I}$ inverse roles: h-child$^-$

$\mathcal{N}$ NRs: $(\geq n$ h-child$)$

$\mathcal{Q}$ Qual. NRs: $(\geq n$ h-child Blond$)$

$\mathcal{O}$ nominals: "John" is a concept

$\mathcal{F}$ feature chain (dis)agreement

$\cdot_{R^+}$ declare roles as transitive

$\cdot^{\neg,\cap,\cup}$ Boolean ops on roles

Complexity of DLs: Overview of the Complexity of Concept Consistency

P	(co-)NP	PSpace	ExpTime	NExpTime
$\mathcal{ALN}$ without $\sqcup$	$\mathcal{ALUN}$ (NP) without $\exists$, only $\neg A$	$\mathcal{ALCN}$ (wrt acyc. TBoxes)		
	$\mathcal{ALE}$ (co-NP) without $\sqcup$ and NRs, only $\neg A$			
subsumption of $\mathcal{FL}_0$ $\sqcap$ and $\forall$ only	subsumption of $\mathcal{FL}_0$ (co-NP) wrt acyc. TBoxes			

$\mathcal{I}$ inverse roles: h-child$^-$

$\mathcal{N}$ NRs: $(\geq n$ h-child$)$

$\mathcal{Q}$ Qual. NRs: $(\geq n$ h-child Blond$)$

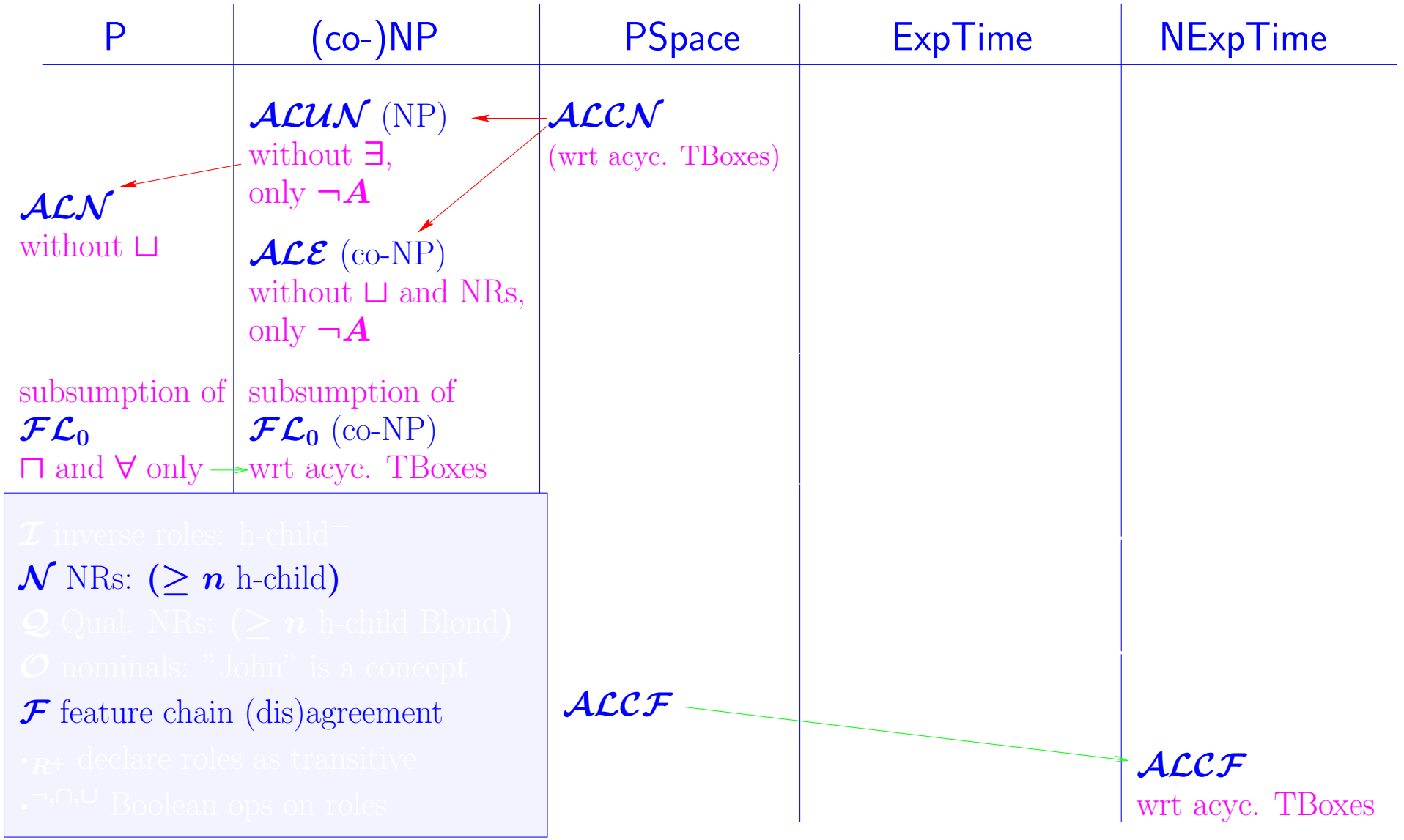
$\mathcal{O}$ nominals: "John" is a concept

$\mathcal{F}$ feature chain (dis)agreement

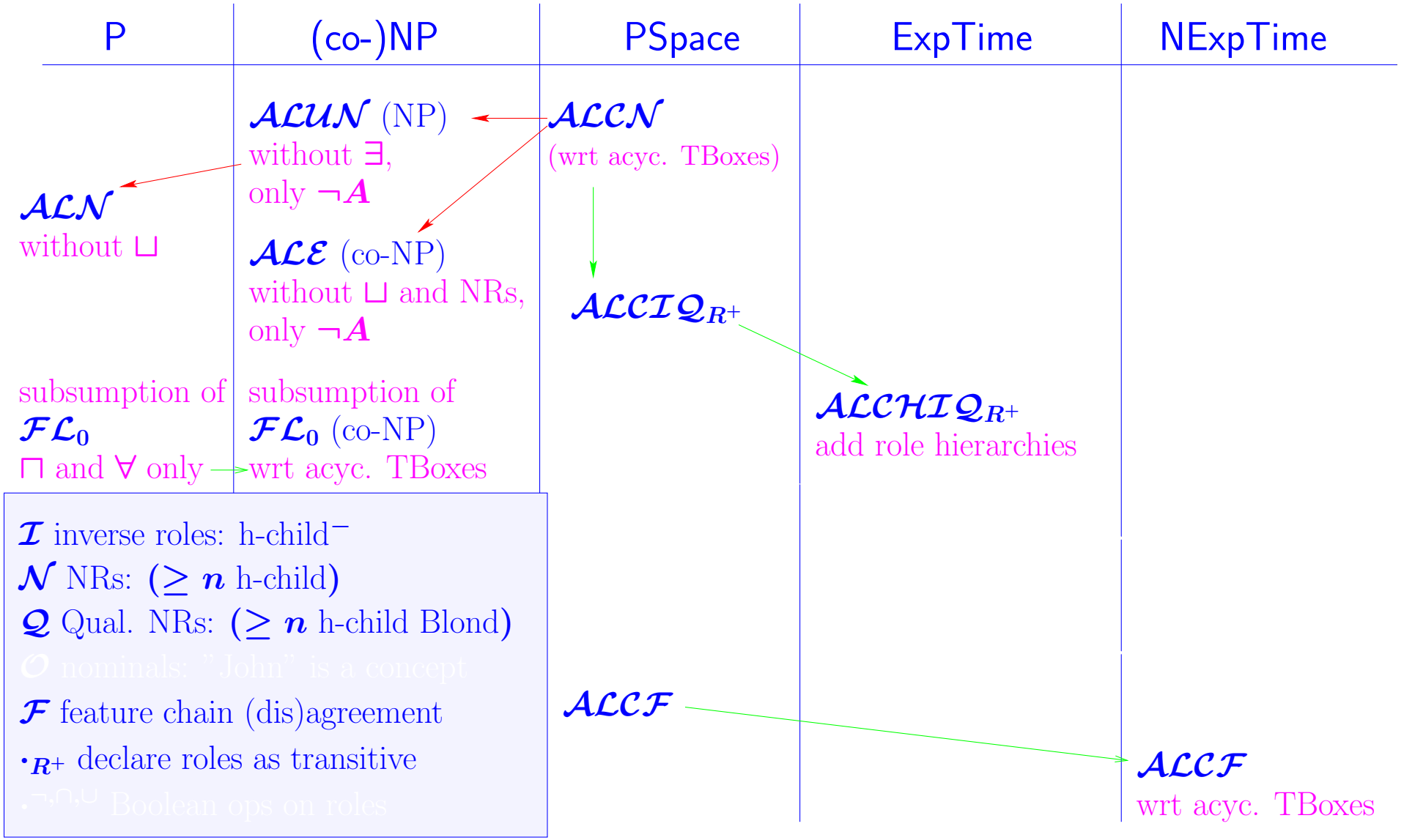
$\cdot_{R^+}$ declare roles as transitive

$\cdot^{\neg,\cap,\cup}$ Boolean ops on roles

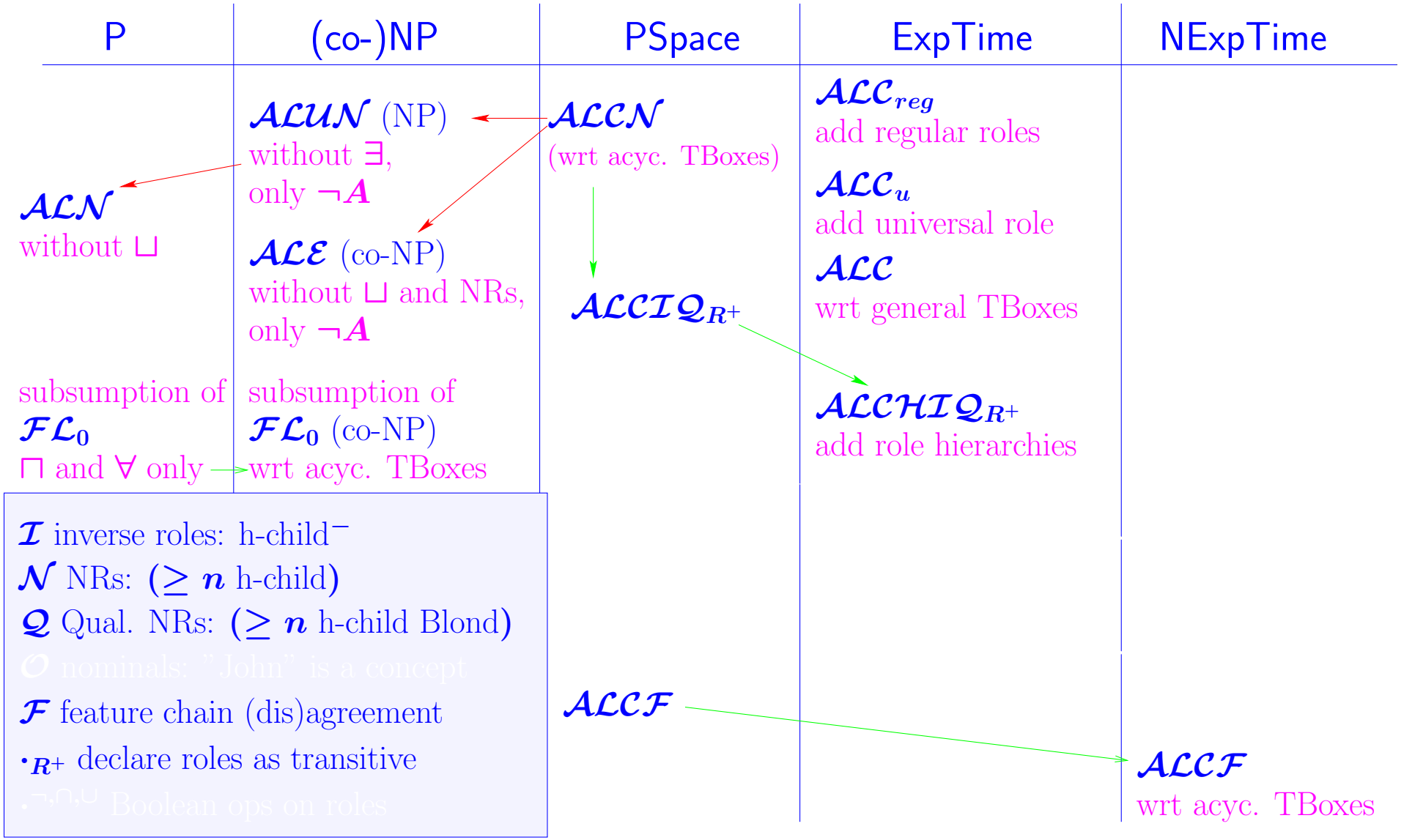
Complexity of DLs: Overview of the Complexity of Concept Consistency



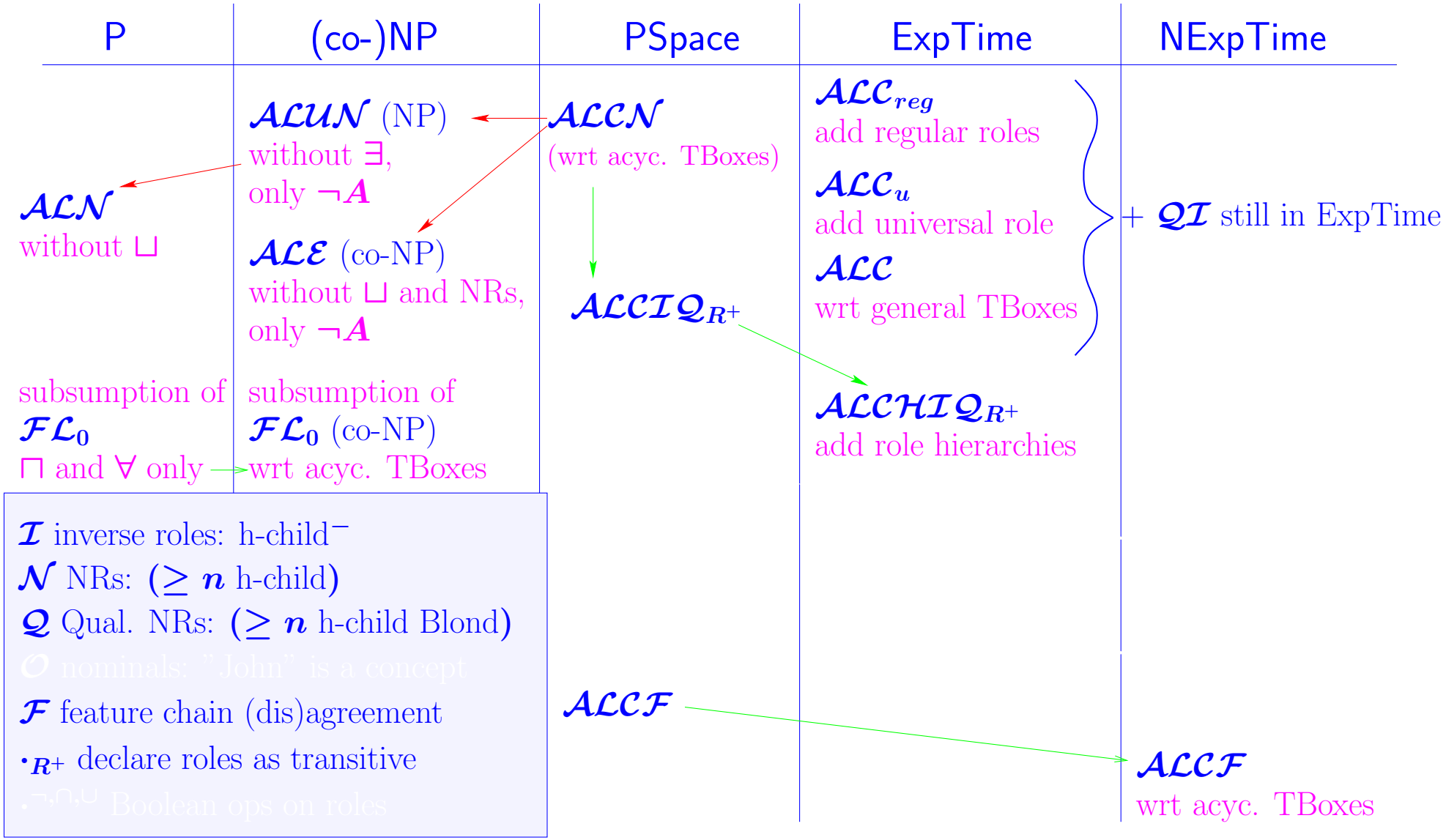
Complexity of DLs: Overview of the Complexity of Concept Consistency



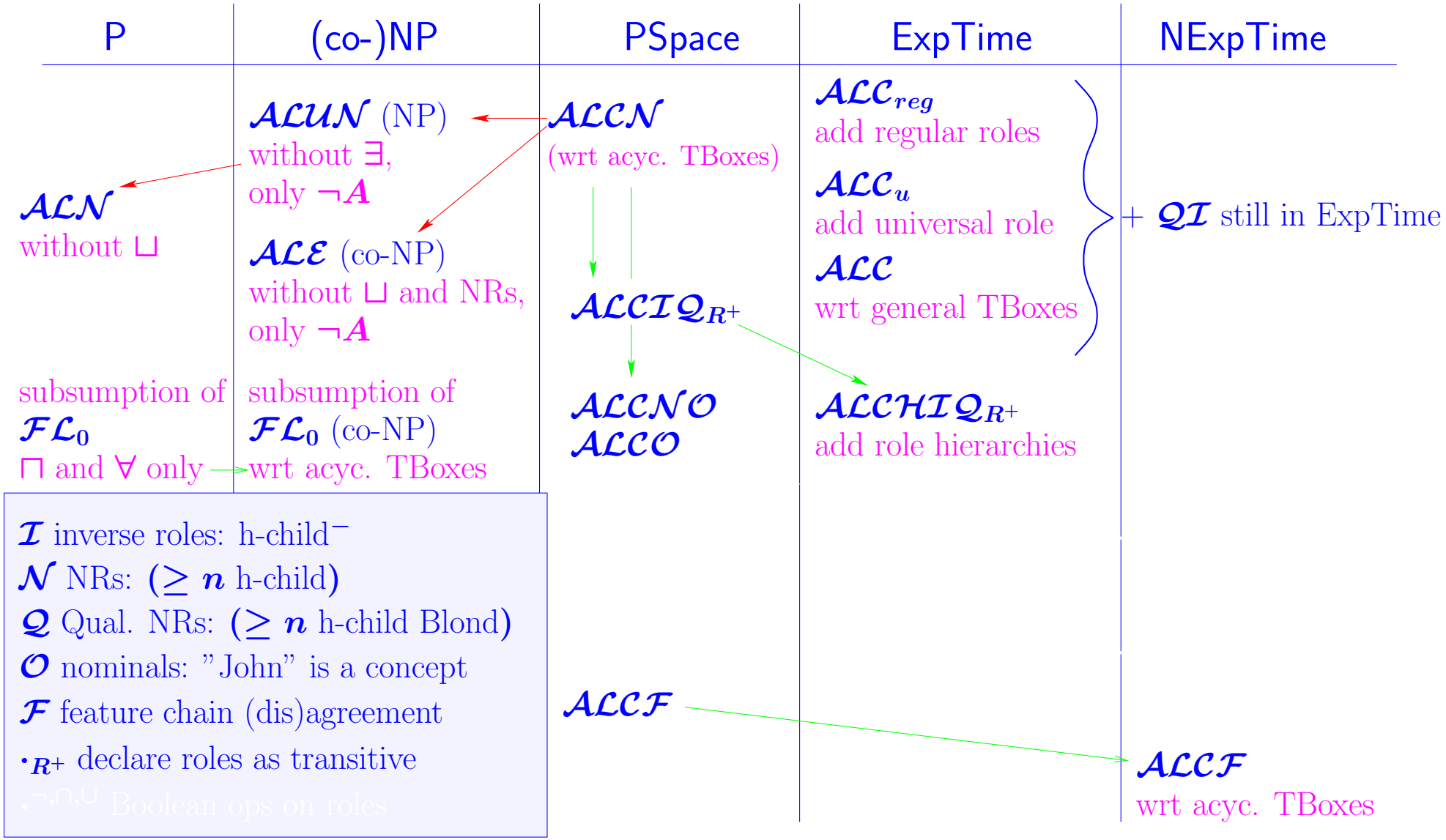
Complexity of DLs: Overview of the Complexity of Concept Consistency



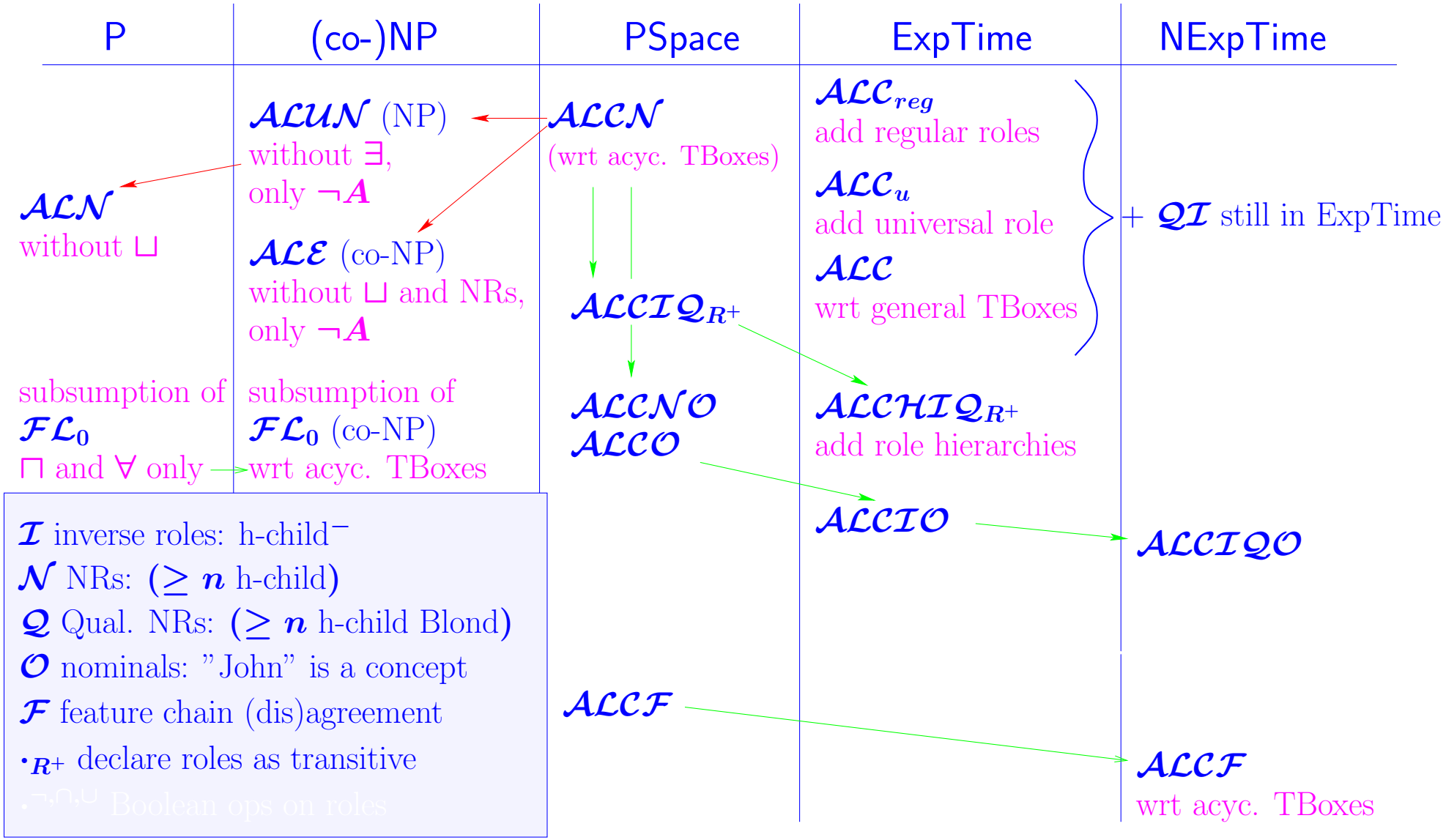
Complexity of DLs: Overview of the Complexity of Concept Consistency



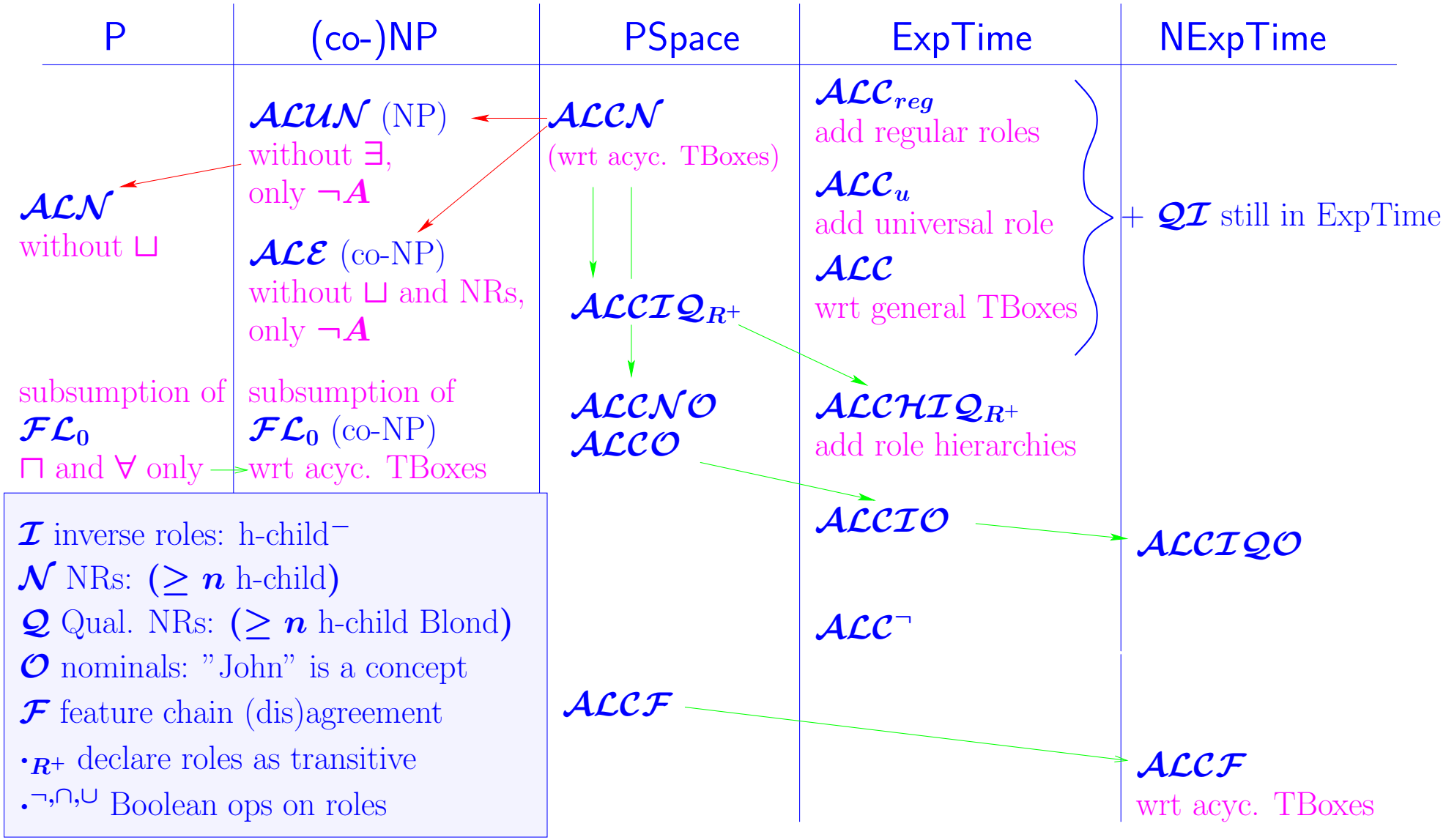
Complexity of DLs: Overview of the Complexity of Concept Consistency



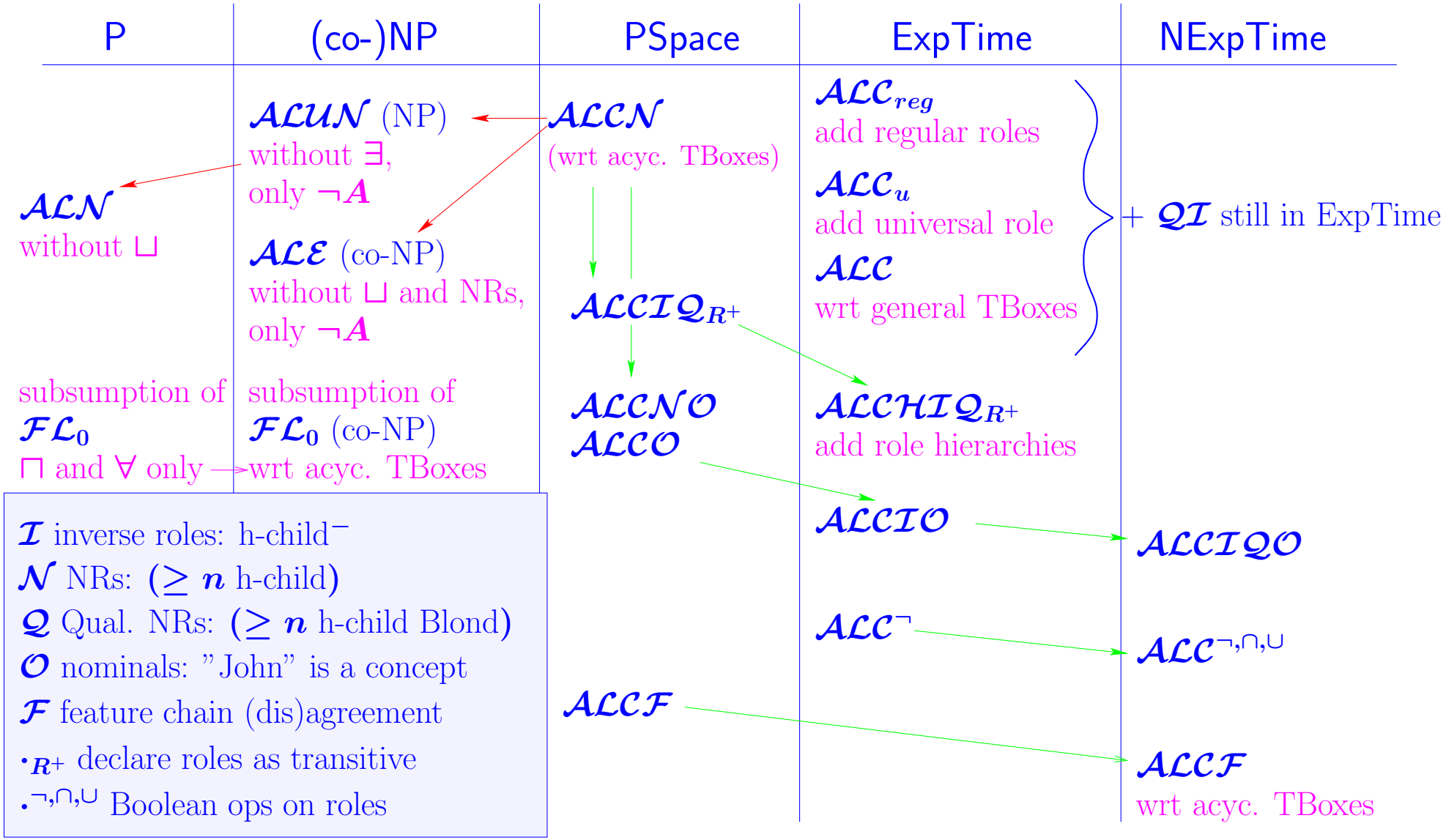
Complexity of DLs: Overview of the Complexity of Concept Consistency



Complexity of DLs: Overview of the Complexity of Concept Consistency



Complexity of DLs: Overview of the Complexity of Concept Consistency



Complexity of DLs: What was left out

We left out a variety of complexity results for

- **concept consistency** of other DLs
  (e.g., those with "concrete domains")
- **other standard inferences**
  (e.g., deciding consistency of ABoxes w.r.t. TBoxes)
- **"non-standard" inferences** such as
  - matching and unification of concepts
  - rewriting concepts
  - least common subsumer (of a set of concepts)
  - most specific concept (of an ABox individual)