Generics and Identity gate

Generics

- Incomplete and partially defined pools
- Group of molecules

- Inconsistencies of the knowledge
- Combinatorial binding
- Polymers

Generics

- **Truly Generic Participants**:
  These are groupings of participants that are formed often through polymerization or random aberrations. Their instances can not be (feasibly) enumerated.
- **Name**: Glycogen

Emek Demir. http://archive.biopaxwiki.org/GenericParticipants

Generics

- **Homologies**:
  These are groupings of similar molecules, often belonging to different but evolutionarily homologous entities.
- Name: ErbB receptor

Emek Demir. http://archive.biopaxwiki.org/GenericParticipants

Generics

- **Analogies**:
- Name: **dNTP, amino-acids, alcogoles, R-groups**

- **Semi-quantitative Modifications**
  These participants have multiple phosphorlyation sites, often found as repeats, to provide a quantitative measure

- **Sufficient Modifications**
  For these participants to participate in a reaction, a certain number of variables are sufficient.

Emek Demir. http://archive.biopaxwiki.org/GenericParticipants

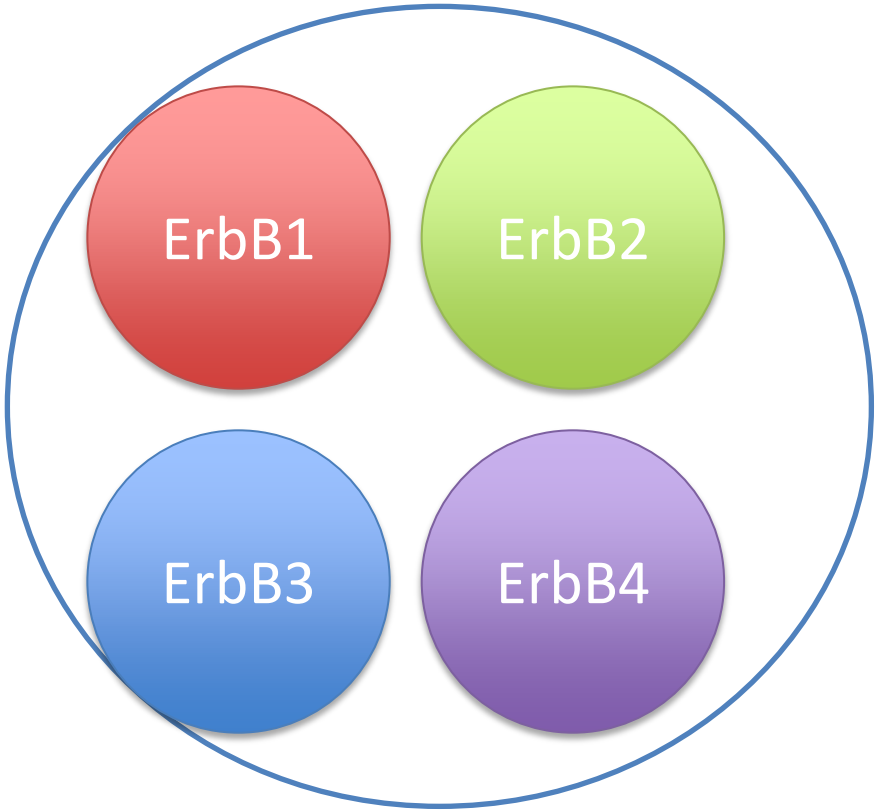
Generics

- **Generic Complexes**
  Generic participants can form complexes in such a manner that they create combinatorially many species, even though species of participants themselves can feasibly be enumerated.

Emek Demir. http://archive.biopaxwiki.org/GenericParticipants

Generics

- Some types of generics could be treated by containment
  - Homologies, analogies, some Sufficient Modifications
- Meta-entity



Extracting reaction networks from databases-opening Pandora's box

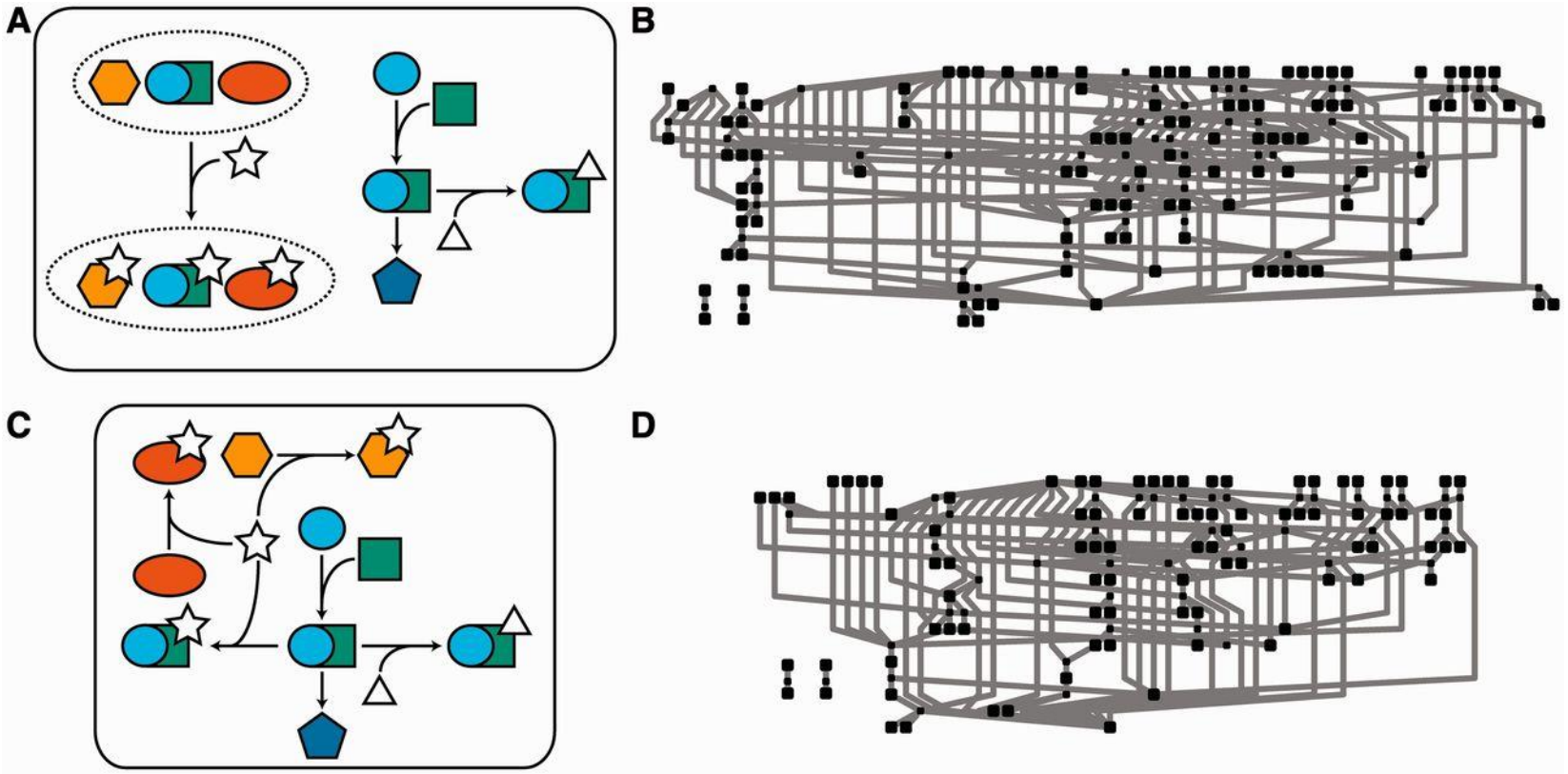
Database	Total number of entities	Meta-entities	Number of complexes	Number of recursive complexes
Reactome	24 477	2419	6040	3485
KEGG*	25 043	4716	–	–
PANTHER	13 241	Unlabelled	913	34
NCI-PID	27 367	Approx 960	9016	2751

Fearnley L G et al. Brief Bioinform 2013;bib.bbt058

Briefings in Bioinformatics

Extracting reaction networks from databases-opening Pandora's box

Bucketing of entities has a significant effect on networks.



Fearnley L G et al. Brief Bioinform 2013;bib.bbt058

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Briefings in Bioinformatics

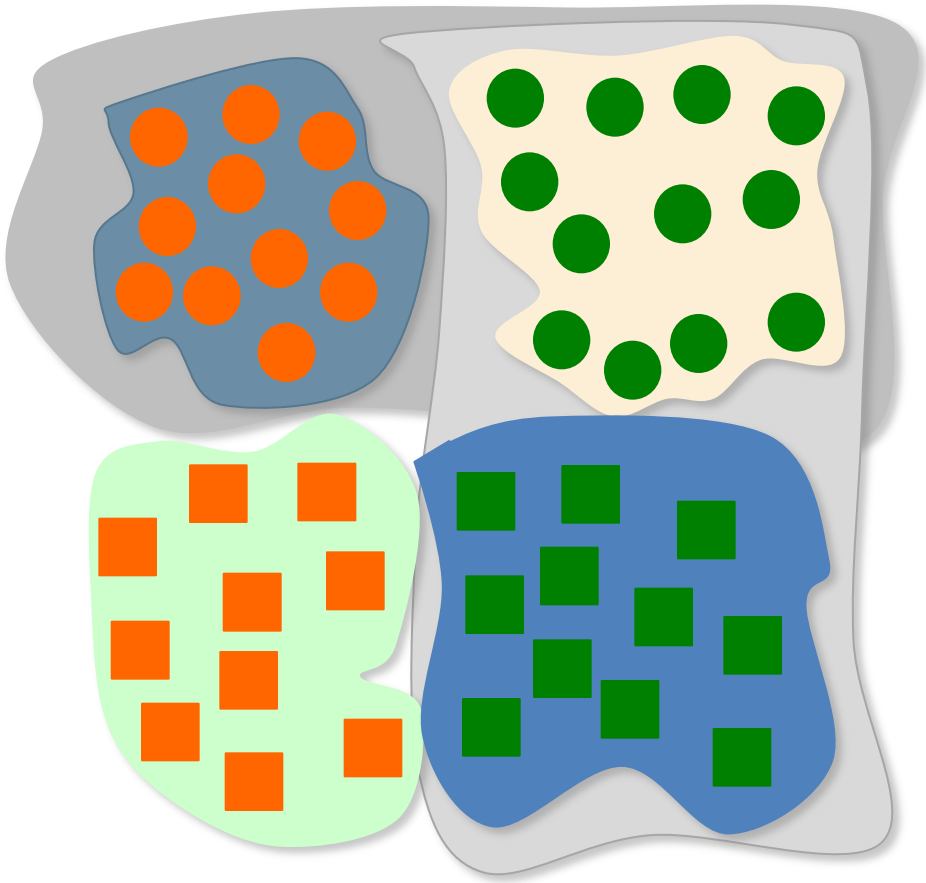
Challenges for meta-entity

- There are three challenges:
  - the construction of new mass-balanced reactions
  - identifying all entities in the network affected by the expansion (as a meta-entity may be a member of another meta-entity or component of a complex)
  - editing the original meta-entity from which molecules have been isolated to prevent loss of information regarding other members.

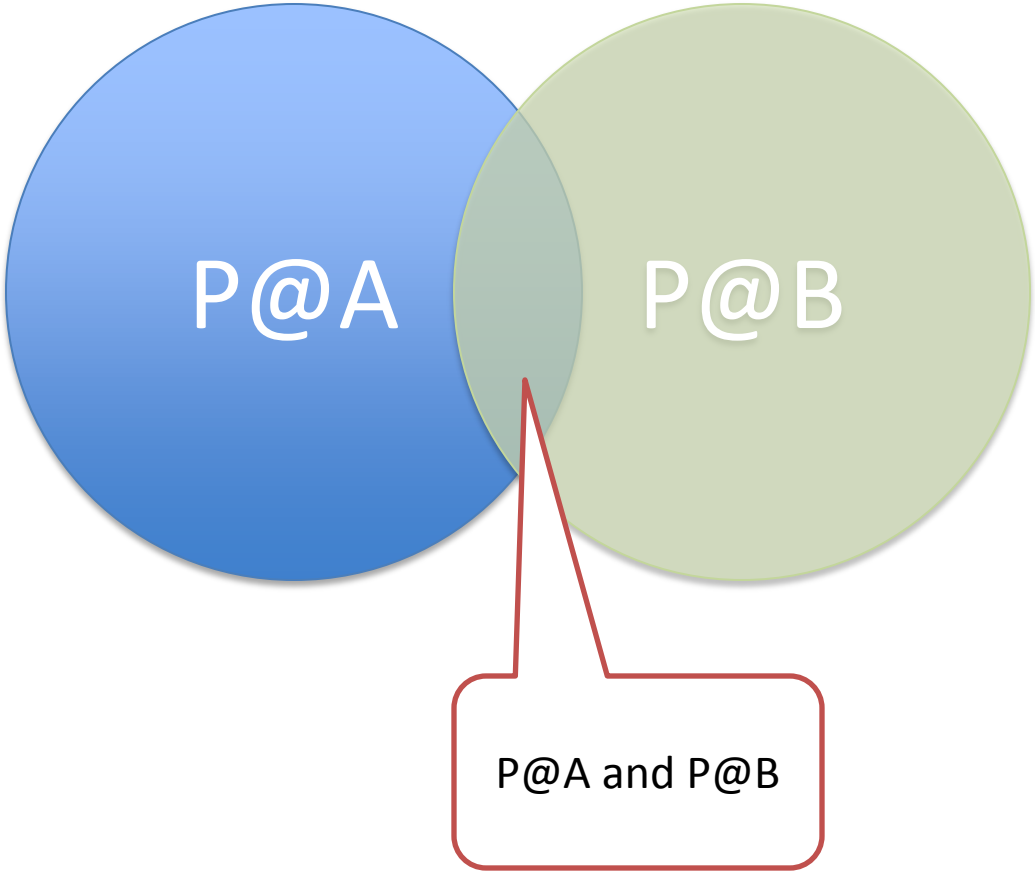
Fearnley L G et al. Brief Bioinform 2013;bib.bbt058

SBGN EPN: Pools of entities

- Collection of molecules indistinguishable in some sense
- Non-overlapping
- Characterized by concentration



Overlapping pools



Containment

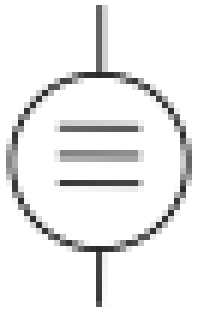
- Containment is similar to
  - Species in different compartments
  - Name prefixes “ErbB” in specific name
- Containment keeps track of containing species
- Useful for combinatorics
- Does not require clone marker
- Could be validated by analysis of the paths in the graph

Identity gate

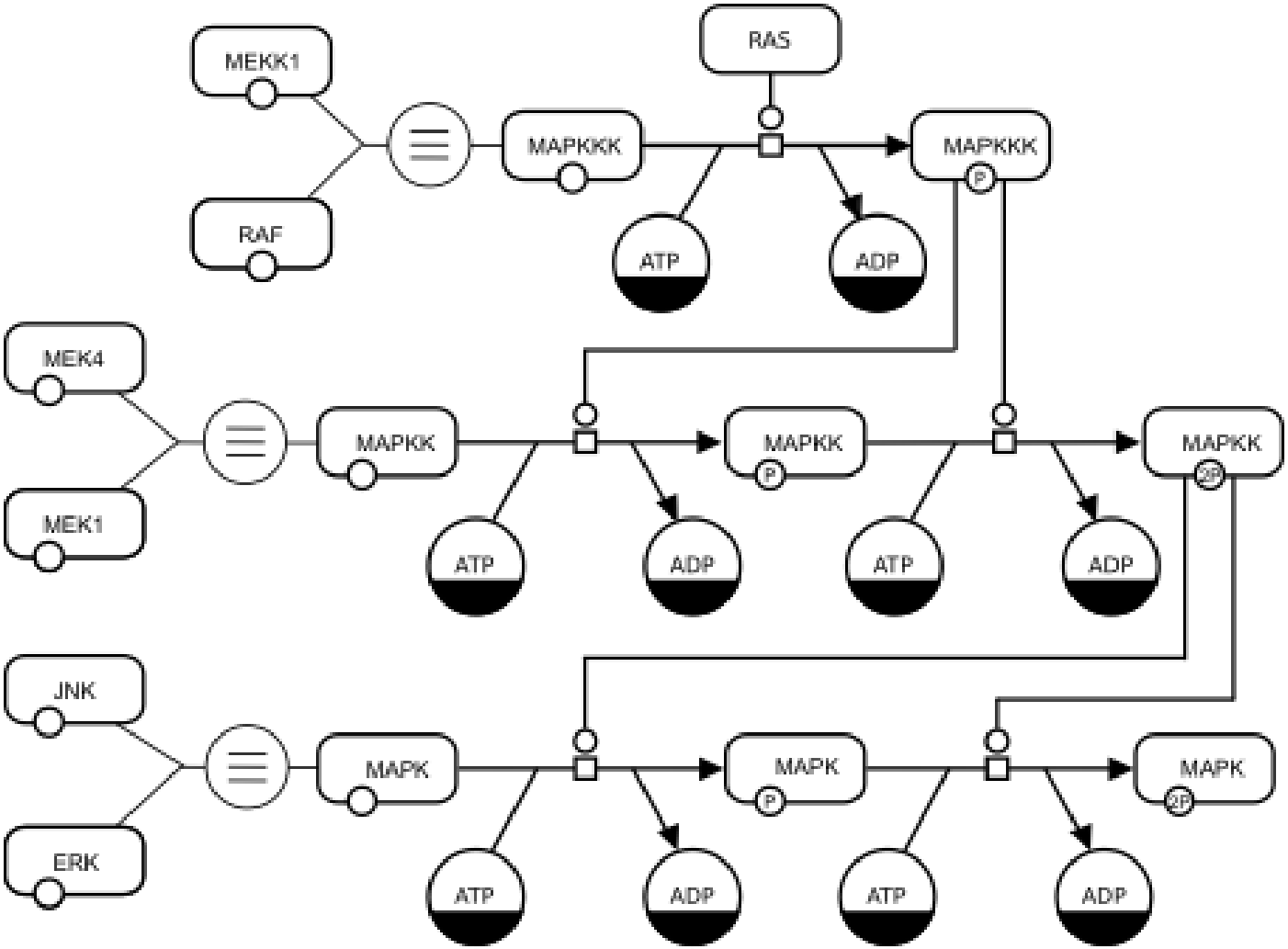
- Proposed semantics

"Identity gate defines containment relationship between set of specific pools and generic pool"

- Allow nesting containment
- Each specific pool could belong to the only one branch of the tree



Set generics

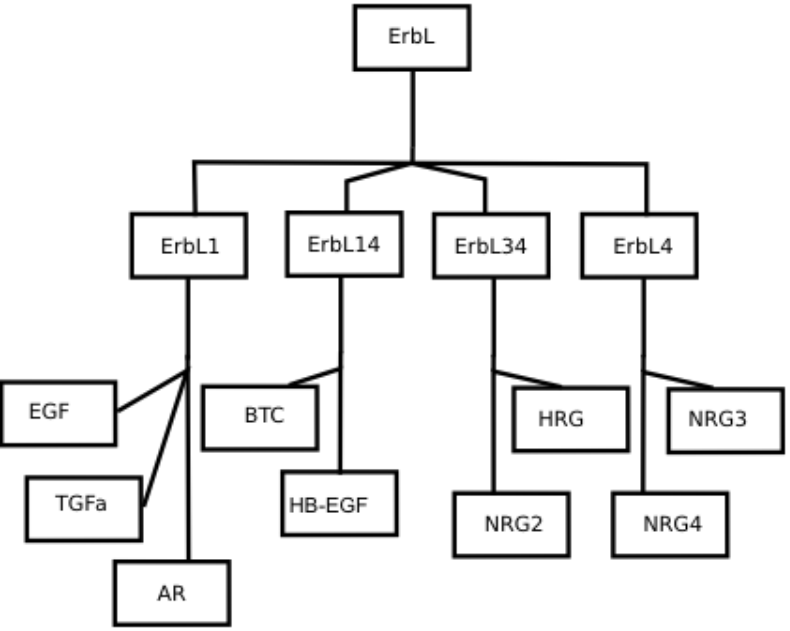


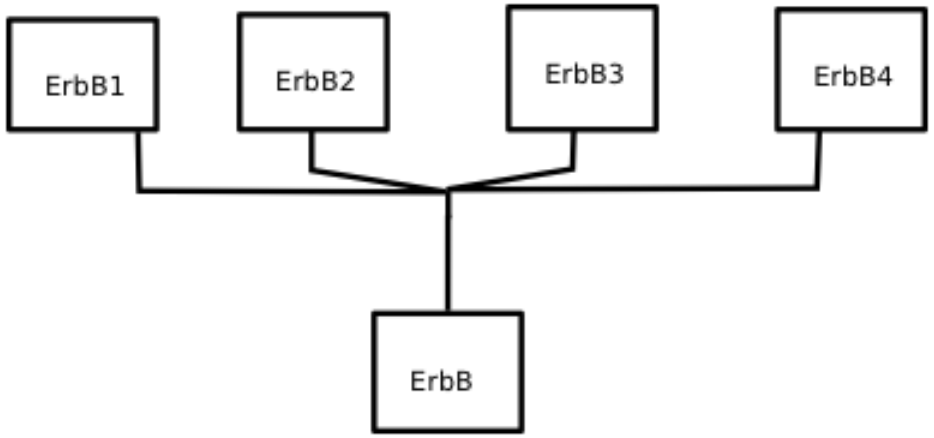
Identity gate

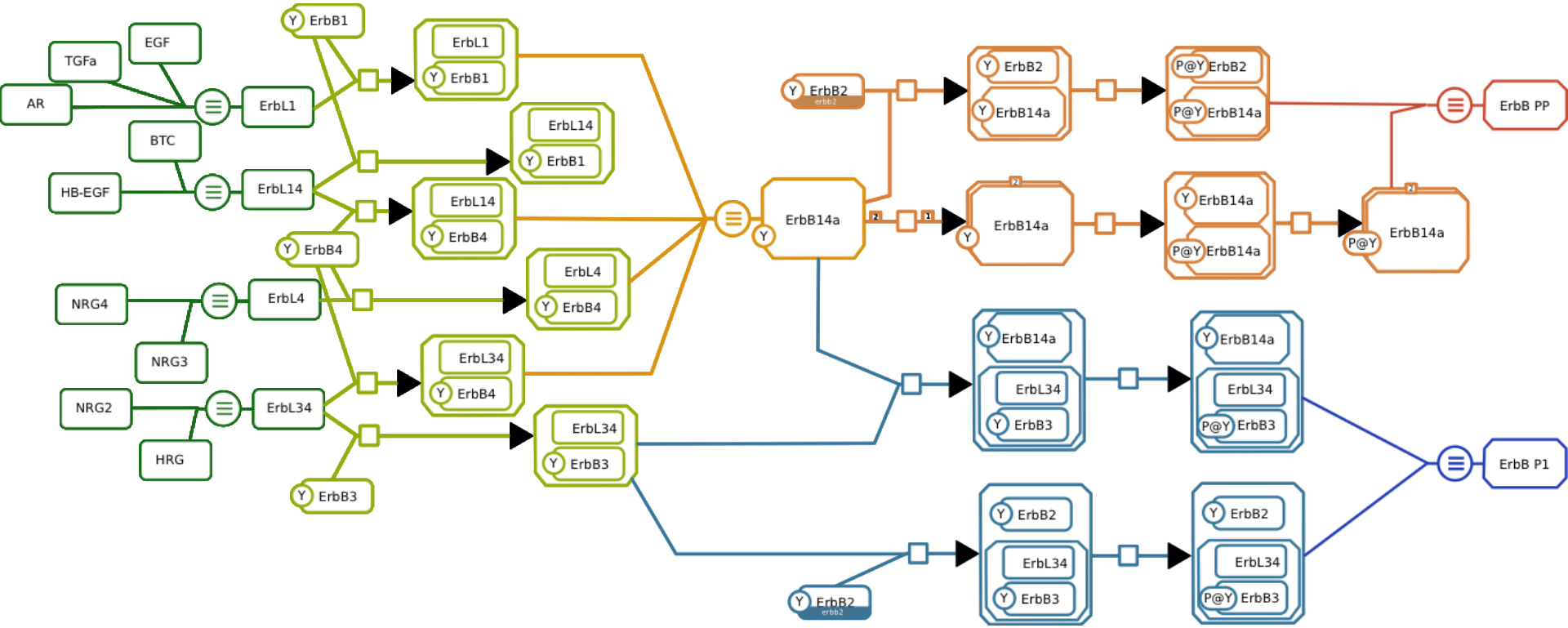
- We going to deal with
  - Homologies
  - Generic Complexes
- Identity gate

ErbB receptors

- Homologous tyrosine-kinase receptors
- ErbB2 unable to bind ligand
- ErbB3 unable to cross-phosphorylate partner in dimer



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BTC
HB-EGF
ErbL14
NRG4
ErbL4
NRG3
NRG2
ErbL34
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ErbB1
ErbB4
ErbB3
ErbL1
ErbB1
ErbL14
ErbB1
ErbL14
ErbB4
ErbL4
ErbB4
ErbL34
ErbB4
ErbL34
ErbB3
ErbB2
ErbB14a
ErbB2
ErbB14a
P@Y ErbB2
P@Y ErbB14a
ErbB PP
ErbB14a
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P@Y ErbB14a
P@Y
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ErbB14a
ErbL34
ErbB3
ErbB14a
ErbL34
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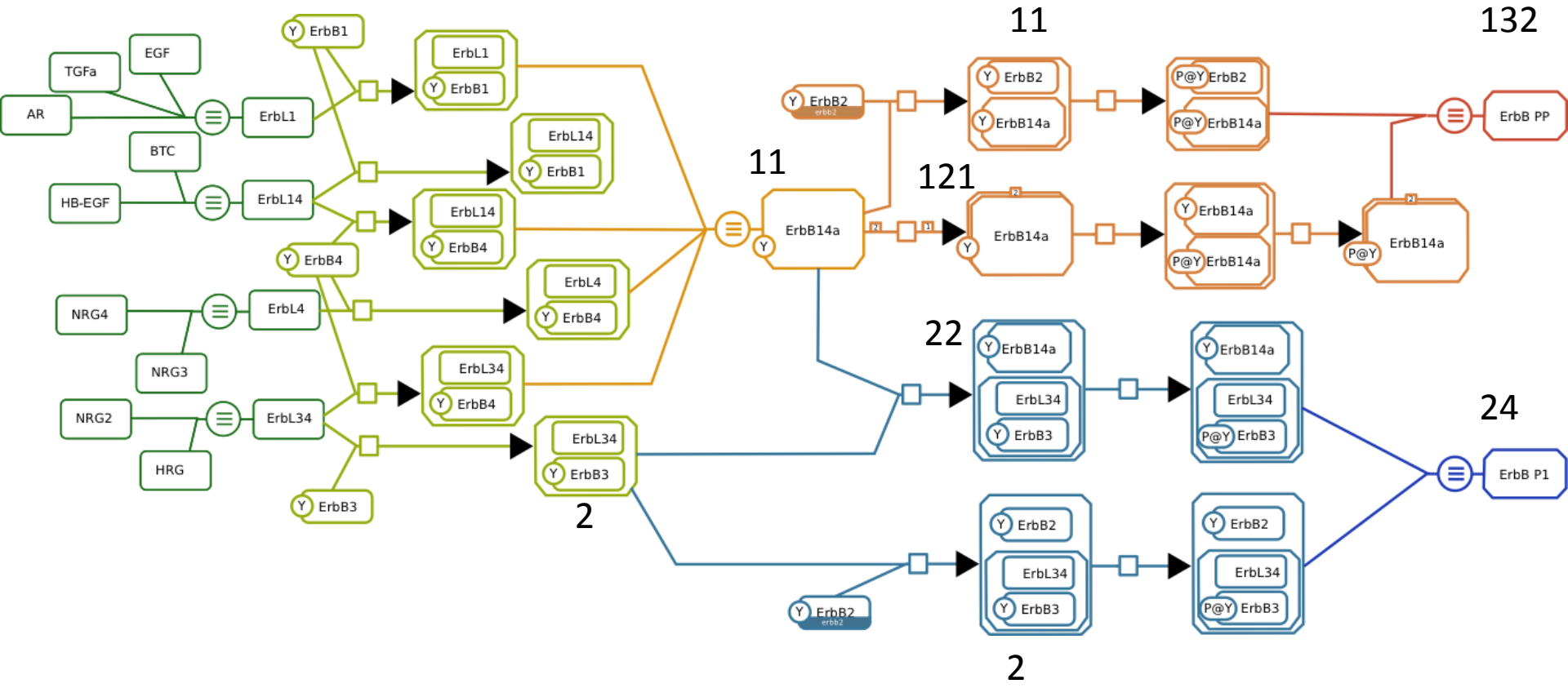
ErbB2
ErbB P1


TGFa
EGF
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BTC
HB-EGF
NRG4
NRG3
NRG2
HRG
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ErbL14
ErbL4
ErbL34
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ErbB4
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ErbB3
24
ErbB P1
ErbB2
ErbL34
ErbB3
ErbB2
ErbL34
P@Y
ErbB3
2

Identity gate

- Generic set representation with containment
- Network connectivity
- Participation traceability
- Compact view