



Theatre of Operations

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Presentation Scope

- The “context”
 - Model-Based Systems Engineering (MBSE)
 - User Needs
 - Operational analysis
 - The performer
- The “solution”
 - The methodology we use to keep focus on the users
 - Intent and focus on user needs
- An “entertaining” example
 - Theatre company - The Scottish Play
 - Abstraction to general model



What is MBSE

- What is Systems Engineering?
 - Systems engineering involves taking a **structured approach** to definition, design and implementation of systems that address defined **user** problems
- What pushes us towards Model-Based?
 - Outsourcing (Sparrow & Wegner 2011)
 - Recording systems knowledge, while retaining the understanding of how to find it
 - Increasing complexity of projects vs understanding capacity (Metcalf's Law vs Miller's 'Magical Number')
 - Teams of Systems Engineers



Where do we use MBSE

MBSE can aid in defining needs and functionality **early in the development cycle** and then proceeding with design synthesis and system validation while considering the **entire systems lifecycle**





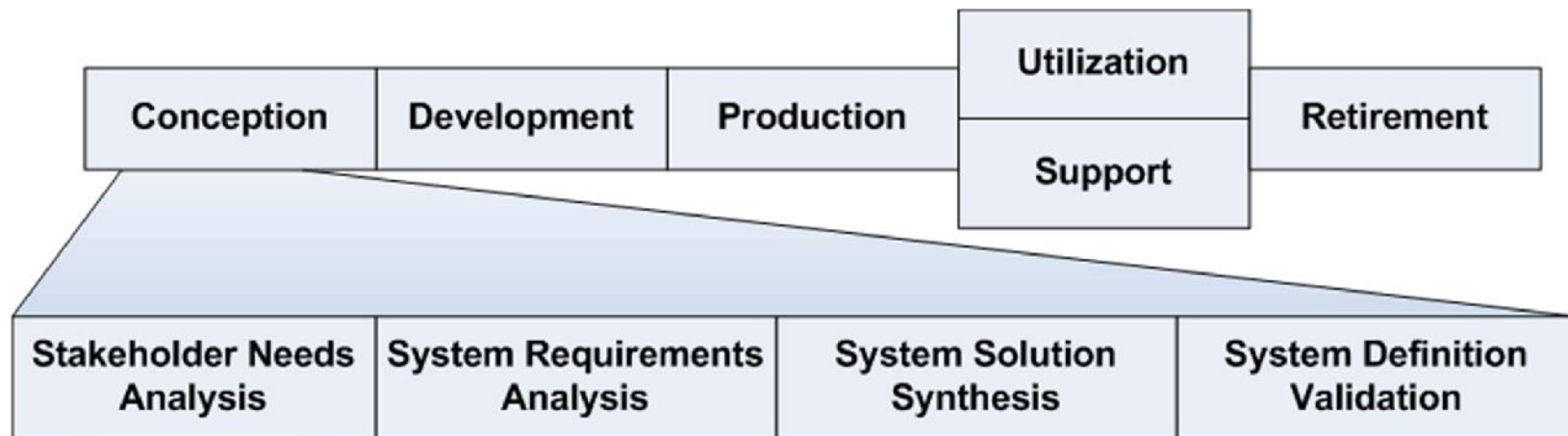
Benefits of MBSE

- Focus on the information of and about the system leads to a number of benefits
 - Traceability
 - Links established and maintained as part of the approach
 - Consistency
 - ‘Single source of truth’
 - Adaptability
 - Any number of views or documents can be produced as snapshots of slices of the model
 - Robustness & information sharing
 - System information made explicitly clear
 - Domain specialist views are possible – without neglecting the interconnected nature of domains



MBSE in the Conception Phase

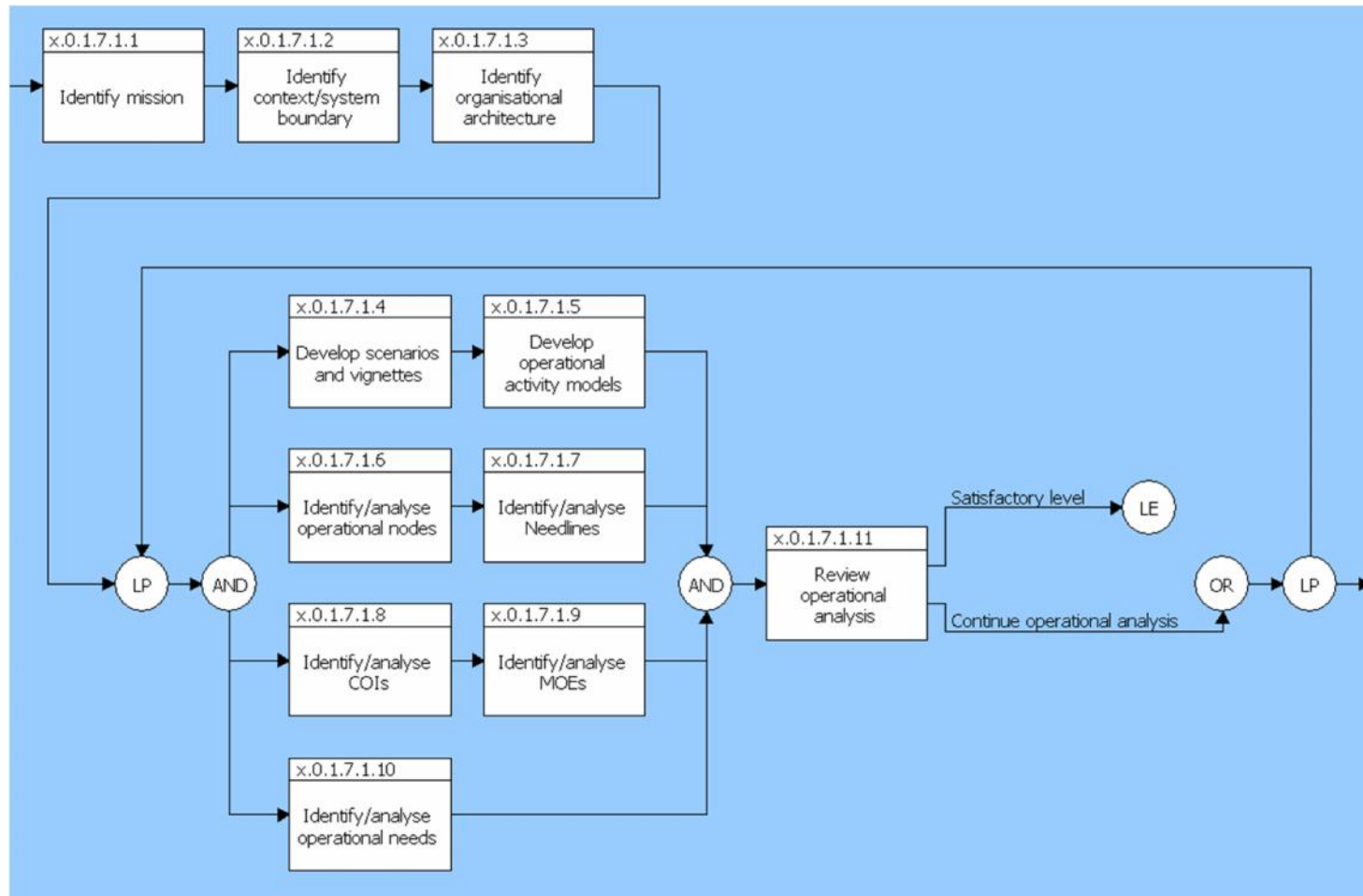
- Conception phase
 - Needs analysis
 - Requirements analysis





MBSE in the Conception Phase

- A detailed look at the conceptual phase, this is how we gather the User's needs





User Needs

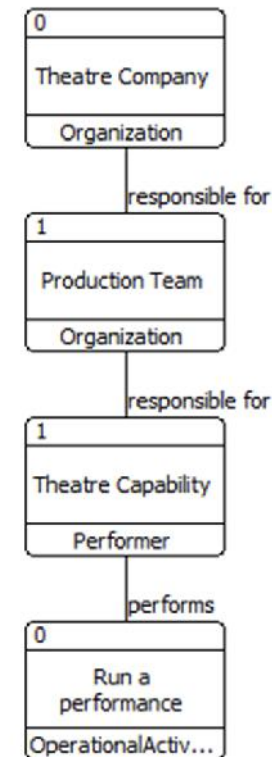
When **MBSE** is applied to capability definition we are able to help people **Ask** for what they **Need**, not just what they **Want**, ensuring the **User is King**





An Entertaining Example

- The CONOPS: A travelling theatre company, putting on “The Scottish play” in a new town.
 - There is a Theatre Company (the Organisation)
 - Who, when mobilised to put on a performance, are given roles to play
 - It has Actors, Crew and Management (the “Performers”)
 - And activities to perform (Scenarios and Vignettes)





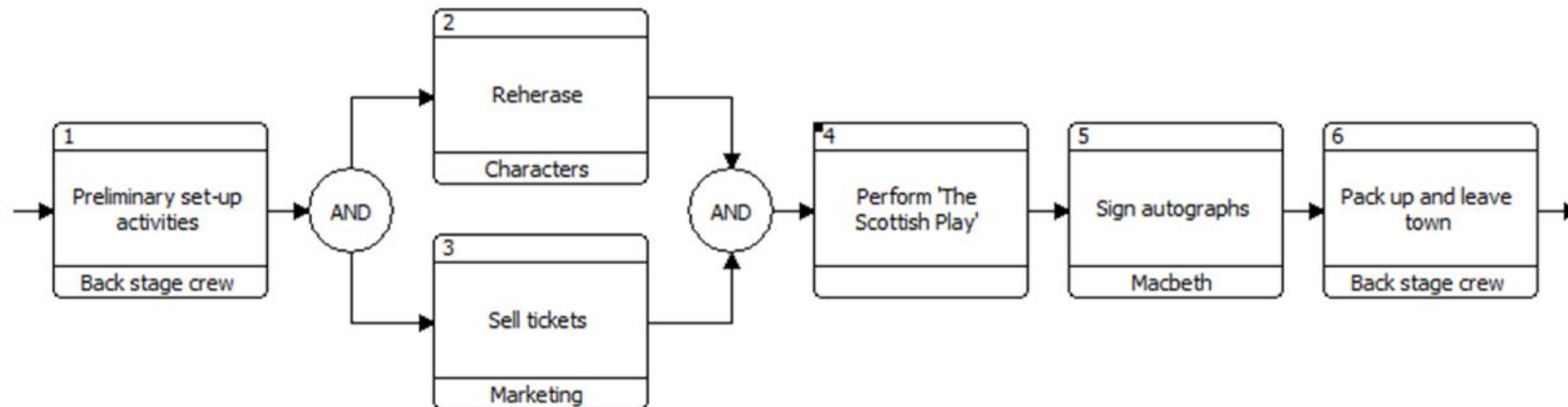
The Scottish Play

Theatre Company Organisation	Roles in The Scottish Play	The Performers
Cast	Principal Actor	Macbeth Lady Macbeth
	Support Actor	Macduff Duncan Banquo Banquo's ghost Angus Ross Witches three Others...
Crew	Back Stage Crew	Stage Hand Lighting guy Sound guy Wardrobe Stage manager
Production	Management	Producer Director Marketing Playwright



The Scottish Play

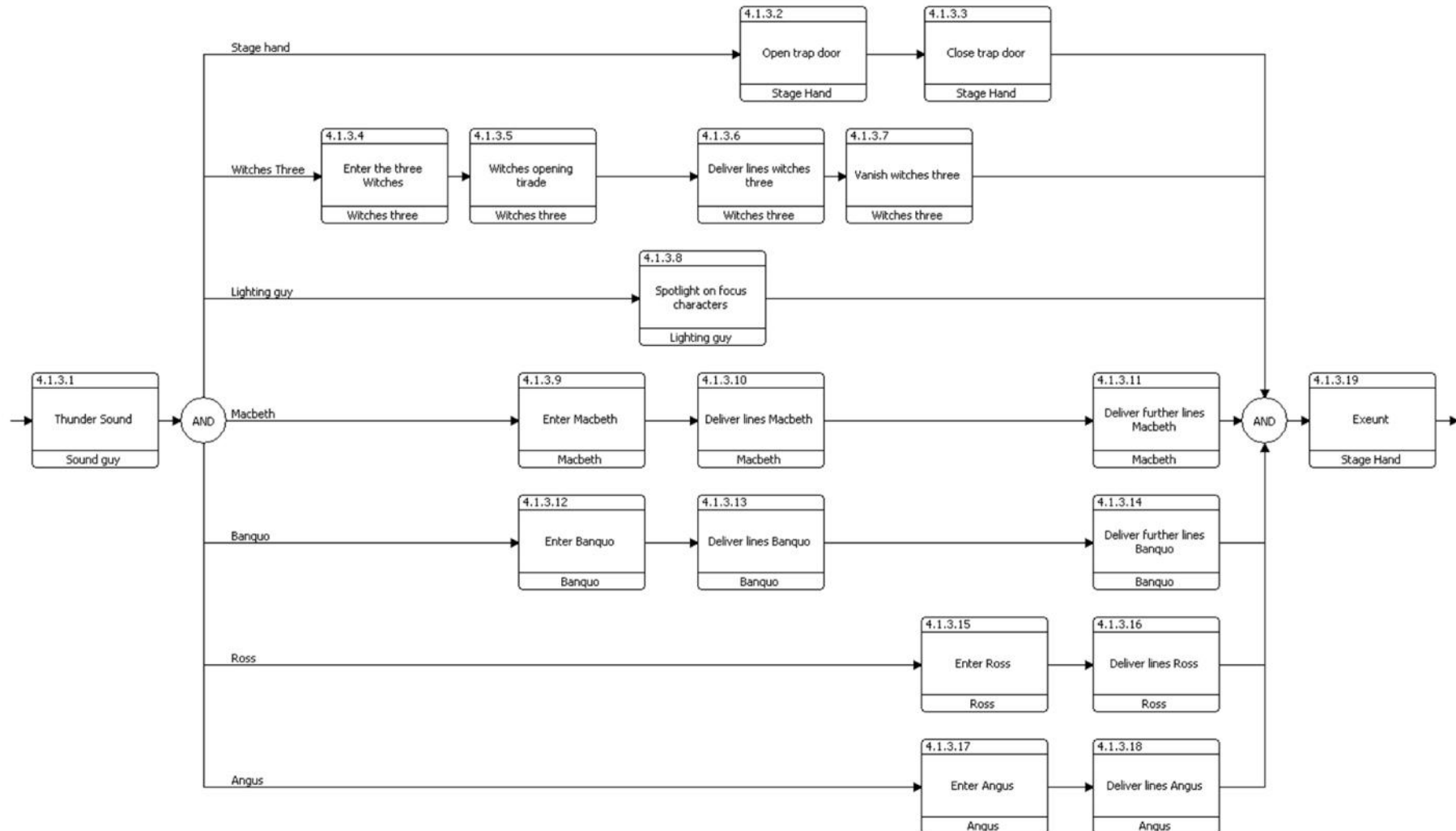
- Our “Campaign” involves the theatre company putting on a performance
 - Note: that this is a simplified model for use in this example, and is therefore not intended to be complete
- Each activity is decomposed down until the activity is performed by a single Performer (i.e. a user class)





Thunder. Enter the Three Witches

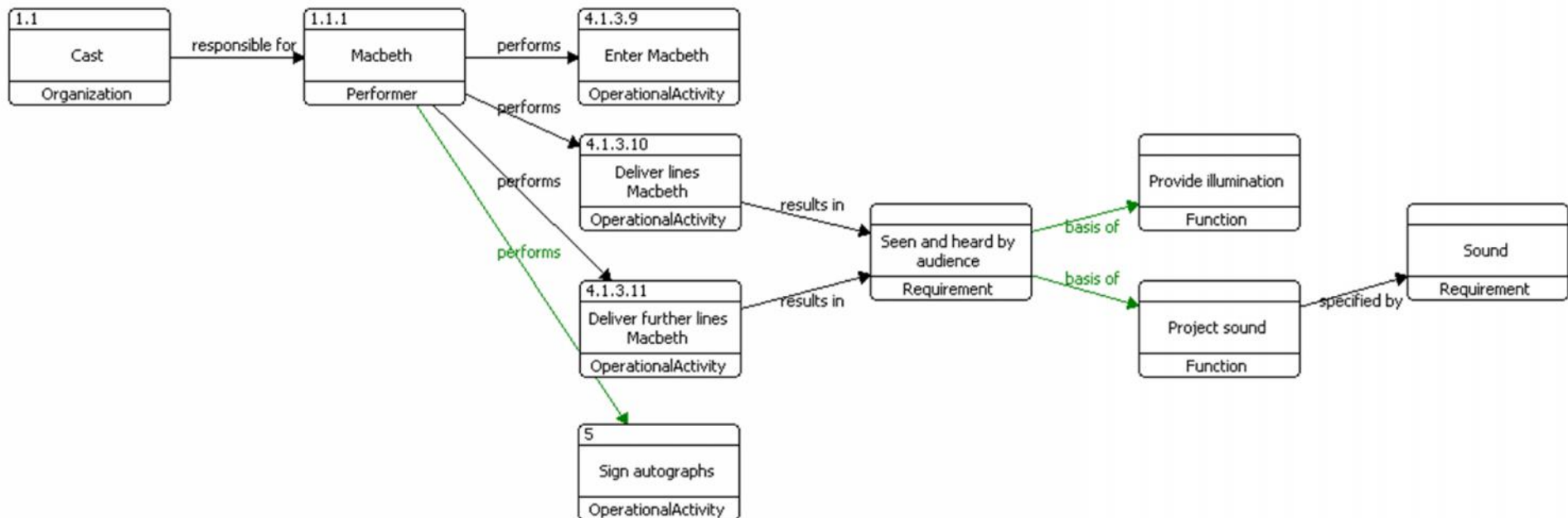
- An example Vignette in our Campaign...Act I Scene III





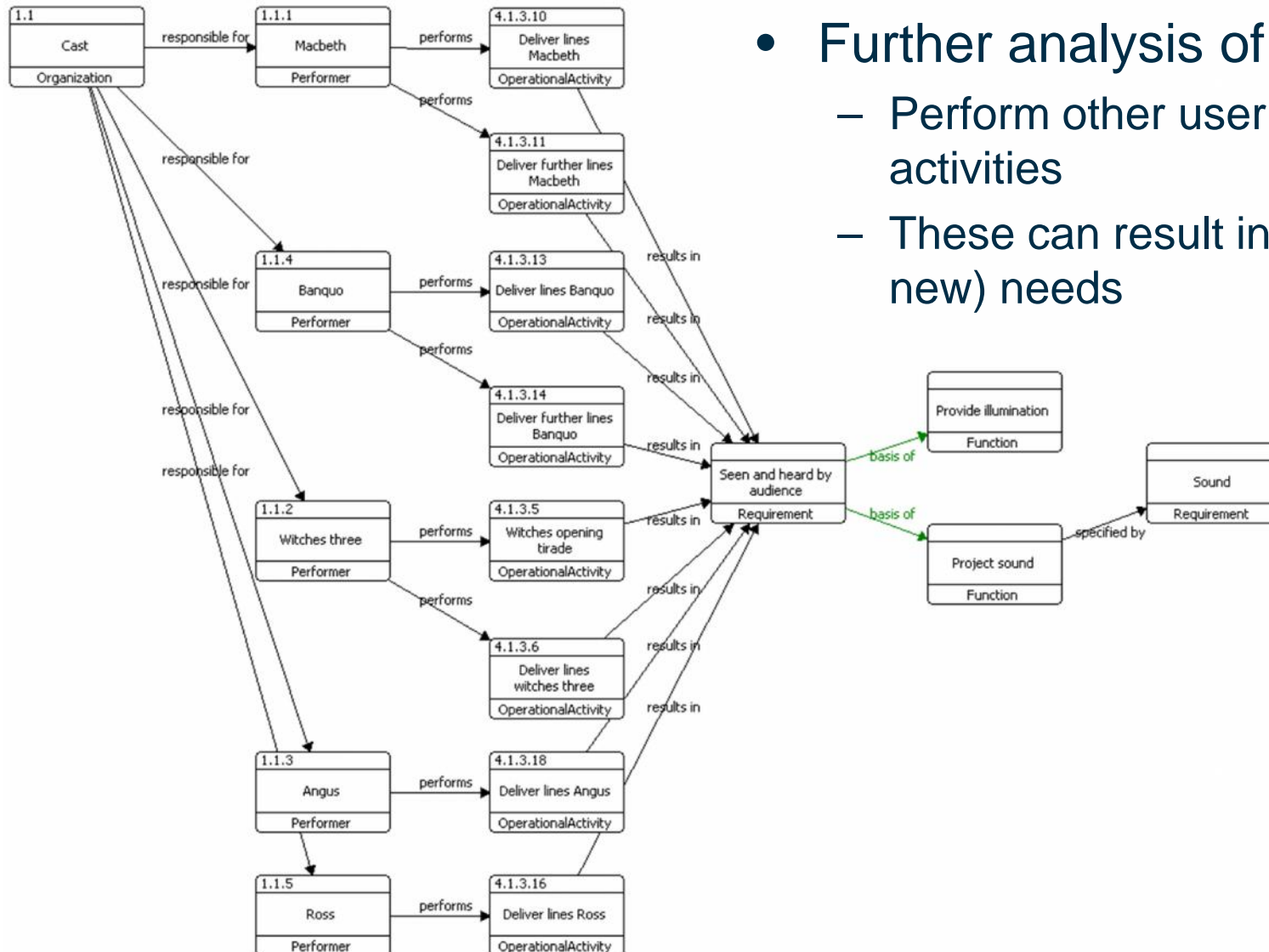
Following a Thread

- The user **Macbeth**
 - A member of the **Cast**, in the principal actor role, becomes the performer **Macbeth**
 - **Macbeth** performs activities in Act I Scene III, such as **Delivering Lines**, and these result in **User Needs**





Following Many Threads

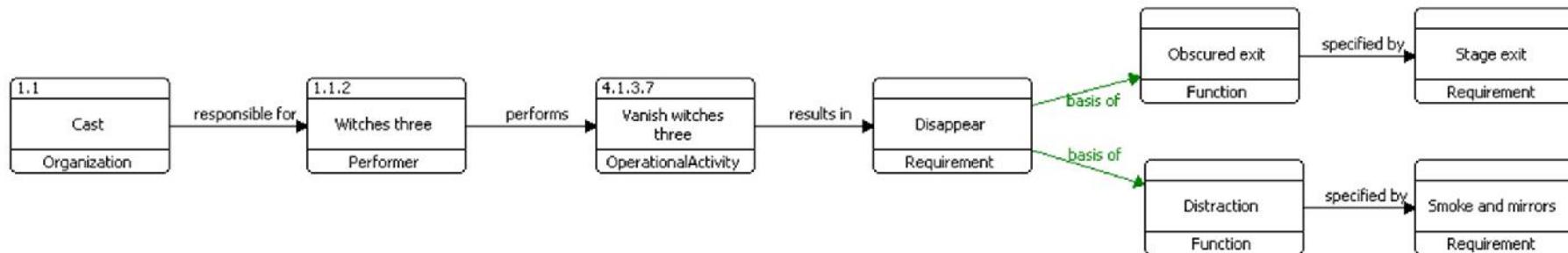


- Further analysis of other users
 - Perform other user specific activities
 - These can result in the same (or new) needs



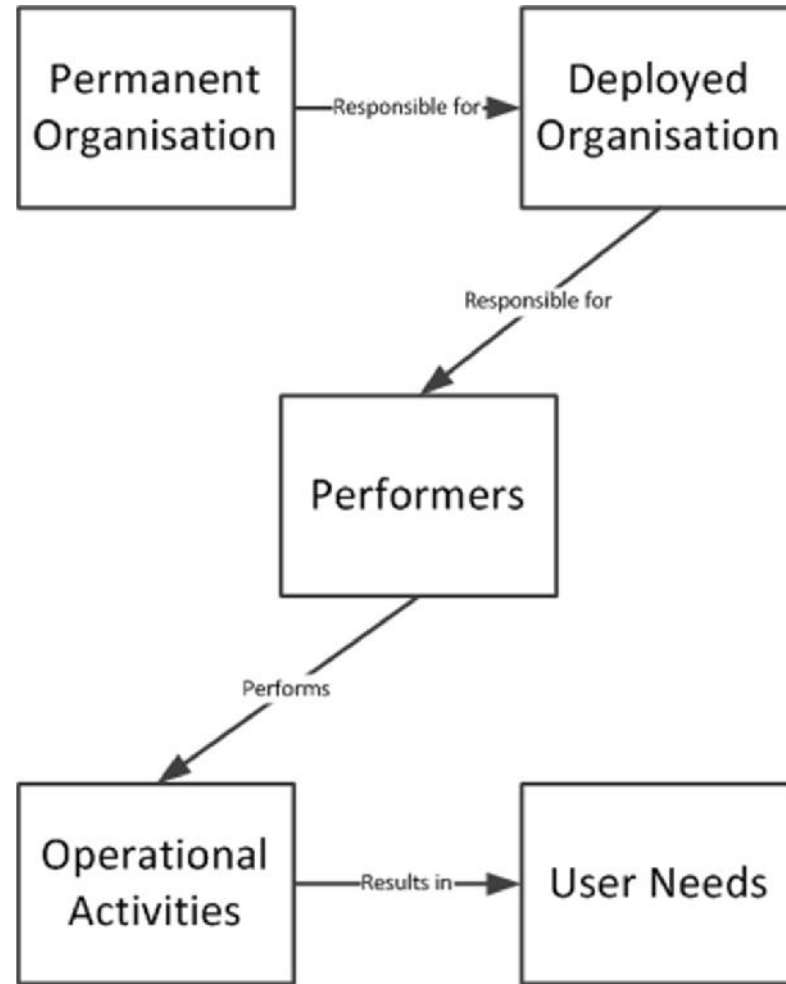
Grouping Users

- The Witches Three
 - The three witches are aggregated up to be a single Performer
 - This decision is based on the level of detail in the Activity Model and the commonality of the Performers
 - We want to keep the knowledge model as simple as possible to elicit all the user needs, but no simpler





General Model Architecture





Conclusion

- MBSE can aid in defining needs and functionality early in the development cycle
- By applying analysis and rigor to the development of a set of Users, or User classes, we can develop a concise yet complete set of user needs
- Just as one user can have many needs, many users can have a shared need
- The person developing the user needs should have a good understanding of the user, and interact with them where possible, to enable user interests to be appropriately defined



Take Home Message

User needs and other stakeholder requirements should be **identified** and described from the perspective of **each class of stakeholder**



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*So, thanks to all at once
and to each one*



Questions?