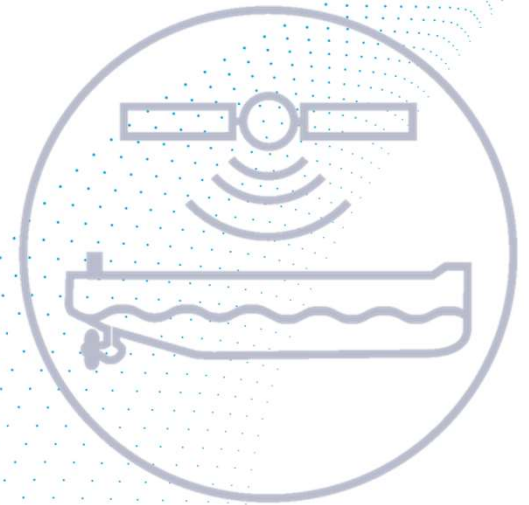




TURN UNCERTAINTY



# Visión de DNV – Buques autónomos



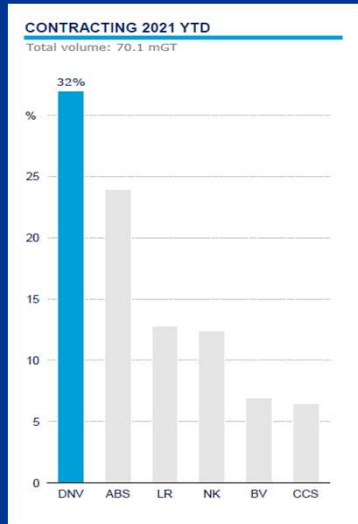
Marian Gálvez, DNV Principal Surveyor, Business Development Manager  
2023-03-22

# ABOUT DNV

## Turn uncertainty into confidence

### MARITIME.- 157 Years

- **Maritime** is our core industry
- **11,678 ships & mobile offshore units** in DNV class, 280.6 mGT
- **Strong presence** in all ship segments
- **Dedicated ship type expert teams** support our clients worldwide
- **Among top performing class societies** in Port State Control statistics
- **350 Maritime offices** across the world



**32% in NB**  
**70.1 mGT**



**3.700**

Maritime staff  
worldwide



**Supply chain and product assurance**

Your independent, trusted assurance partner.



**Energy Systems - DNV in the energy industry**



**Management system certification and training**

We are one of the world's leading certification bodies.



**DNV - Digital Solutions**

DNV is a world-leading provider of digital solutions for managing risk and improving asset performance



**12,500**  
employees  
groupwide

**5%**  
revenue invested in  
R&D activities

# Visión de DNV

- DNV Guideline DNV-CG-0264:
  - ✓ Objetivos
  - ✓ Principios fundamentales
  - ✓ Clasificación de procesos
- Areas susceptibles de automatizar y controlar en remoto
- Componentes de la función autónoma
- Areas a desarrollar : ¿Asegurando las nuevas tecnologías?

# Visión DNV

## DNV Guideline DNV-CG-0264 (desde 2018)



### CLASS GUIDELINE

DNV-CG-0264

Edition September 2021

### **Autonomous and remotely operated ships**

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DNV AS

- > Section 1 General
- > Section 2 Main principles
- > Section 3 Qualification and approval process
- > Section 4 Navigation functions
- > Section 5 Vessel engineering functions
- > Section 6 Remote control centres
- > Section 7 Communication functions
- Appendix A List of potential minimum risk conditions
- > Appendix B List of potential autoremate functions
- > Appendix C Navigation systems - applicability of conventional carriage requirements for autoremate vessels
- > Appendix D Navigation systems - additional systems for autoremate vessels
- > Appendix E Simulator based testing



“Ticket to trade” for autonomous ship functions:

1. Achieve equivalent safety
2. Verify and document equivalent safety

# Objetivos:

- Proporcionar ORIENTACIÓN en:
  - ✓ implementación segura de las nuevas tecnologías en la aplicación de funciones autónomas y/o controladas a distancia
  - ✓ el proceso de trabajo para obtener la aprobación de nuevos conceptos.
- Proporcionar MARCO que garantice que la aplicación de estos nuevos conceptos y tecnologías

# Objetivos:

- La guía se basa en :
  - ✓ diseños de buques que cumplen con las principales reglas de clase de DNV
  - ✓ en los procesos que conducen a un certificado de clase para un buque.
- Las notaciones de clase para los conceptos operativos están en desarrollo → se utilizará una notación descriptiva y que puede asignarse al buque si se solicita.



# Principios fundamentales

- Los siguientes principios fundamentales constituyen la base del enfoque de DNV para la evaluación de buques autónomos y operados a distancia :
  - ✓ equivalent safety
  - ✓ risk-based approach
  - ✓ operational focus
  - ✓ minimum risk conditions
  - ✓ functional focus
  - ✓ degrees of automation and human involvement per function
  - ✓ system engineering and integration
  - ✓ design principles
  - ✓ software engineering and testing
  - ✓ cyber security.



# Clasificación

**OPERATOR'S  
ASSISTANCE**

Apoyo a la  
decisión

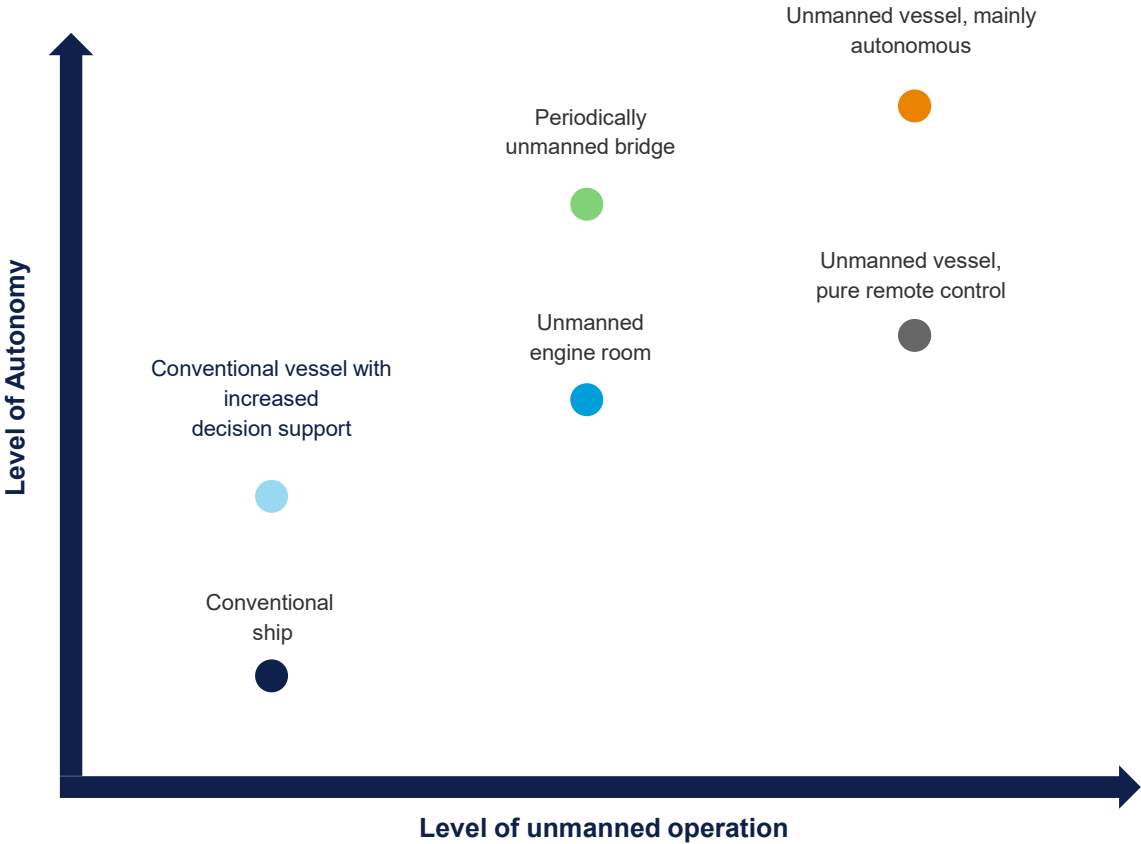
**PARTLY OR  
PERIODICALLY  
MANNED**

Reducción de la  
dotación

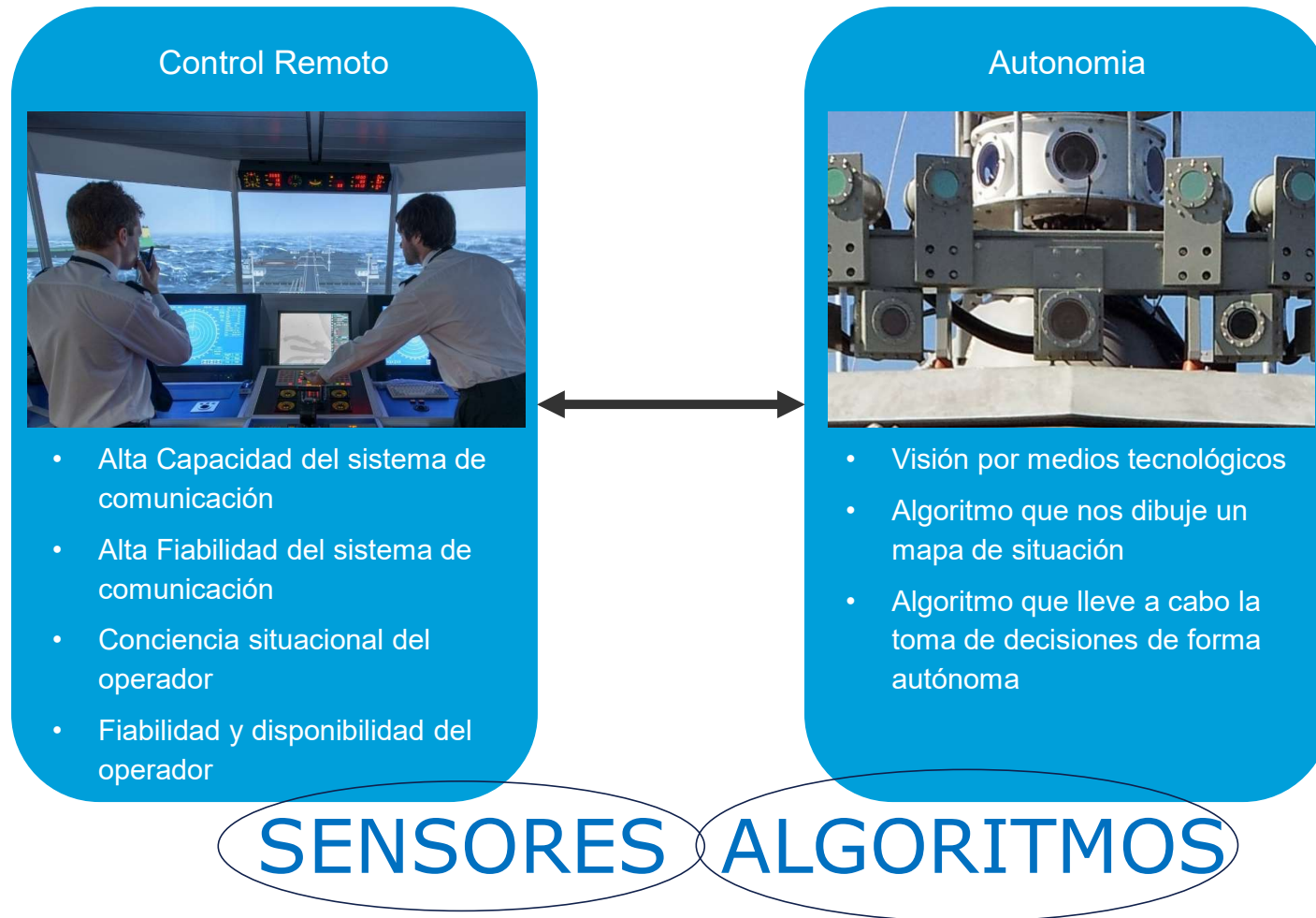
**UNMANNED,  
REMOTE/  
AUTONOMOUS**

Buque sin  
tripulación

# Clasificación



# Control Remoto + Autonomía = Buque no tripulado Autónomo



- Diferentes tipos de autonomía tienen diferentes niveles con respecto a **qué** y **cómo** automatizar.
- Se requiere por tanto una descripción y distribución de tareas y responsabilidades operativas



Realizado a bordo por la tripulación



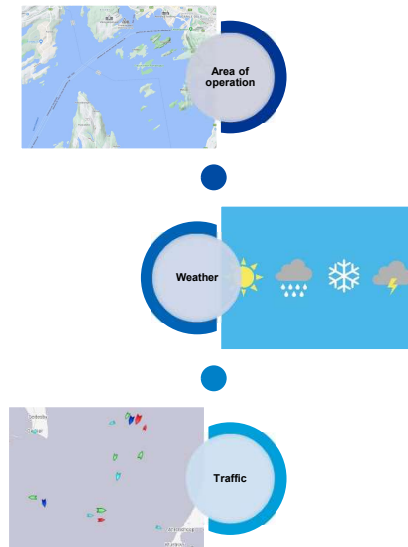
Realizado a distancia por un operador



Realizado por un sistema a bordo



Realizado por un sistema fuera del barco



# How different novelty-levels are dealt with

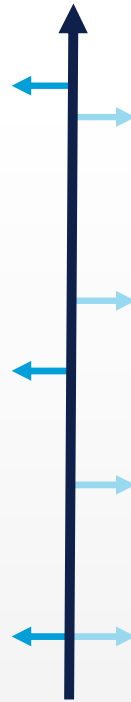
## CHARACTERISTICS

**Unknown** territory,  
no precedence exist

**Major** changes to  
existing tasks/  
technology

**Minor** changes to  
existing tasks/  
technology

High novelty



No novelty

## APPROACH

**Case by case**, risk based approach  
based on an initial hazard/risk-lists

**Specific topics** to be addressed.  
The guide lists the topics  
without going into much details.

**Equivalence considerations**  
towards existing rules,  
guidance on how to create equivalent solutions

**Apply the intention** of existing rules  
in a new setting, guidance on  
interpretations is given.

# Áreas susceptibles de automatizar y controlar en remoto



**Navegación**



**Maquinaria y Propulsión**



**Comunicaciones**



**Centro de Control**

# Componentes de la función autónoma

## - Funciones y sistemas a considerar:

- Mando y control remoto
- Integridad estanca
- Seguridad contra incendios
- Lastrado
- Lastre, bombeo y achique
- Fondeo
- Manipulación de la carga
- Mantenimiento
- Comunicación
- Navegación y maniobras
- Propulsión
- Rumbo
- Suministro de energía eléctrica
- Monitorización y Control

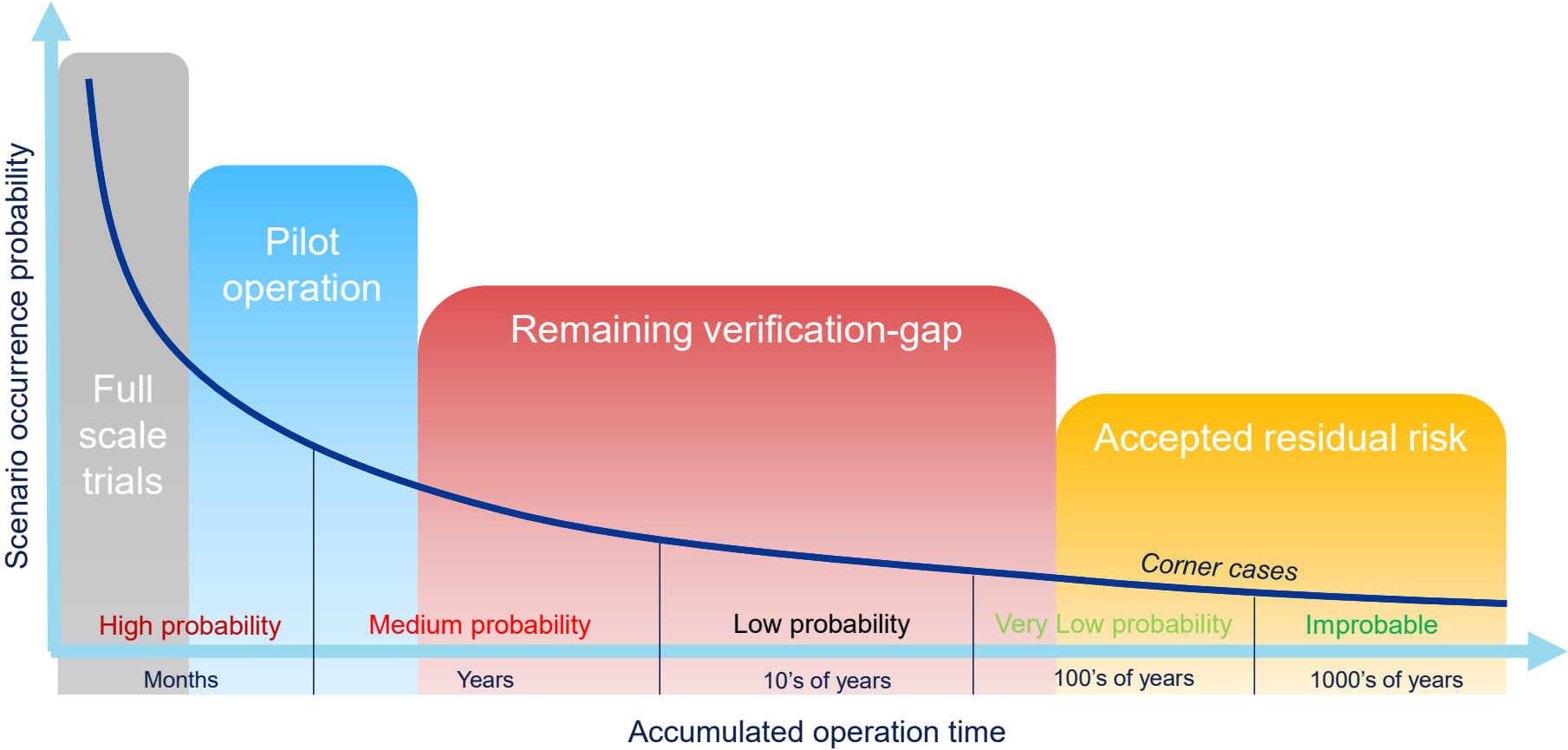


El **nivel de automatización** de cada una de estas funciones dependerá del **grado de autonomía** que se quiera alcanzar en cada proyecto.



# Assurance principles and approach

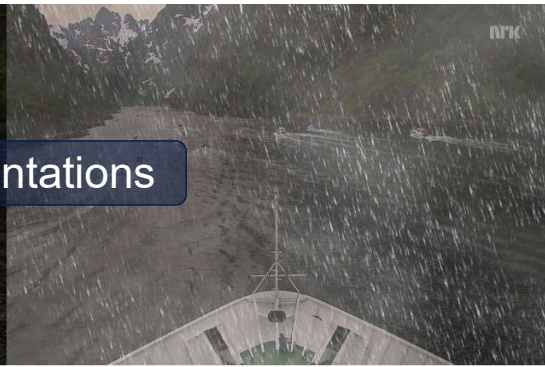
# Chasing the tail of events



# Test- tools and strategies



Augmentations



Analytical risk assessment



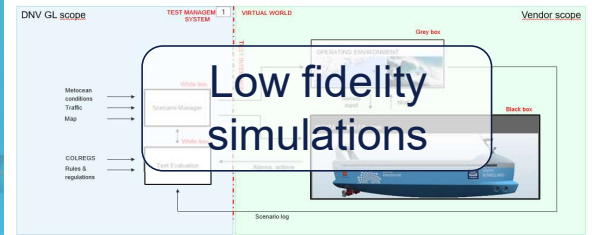
High fidelity simulations



Operational data analytics

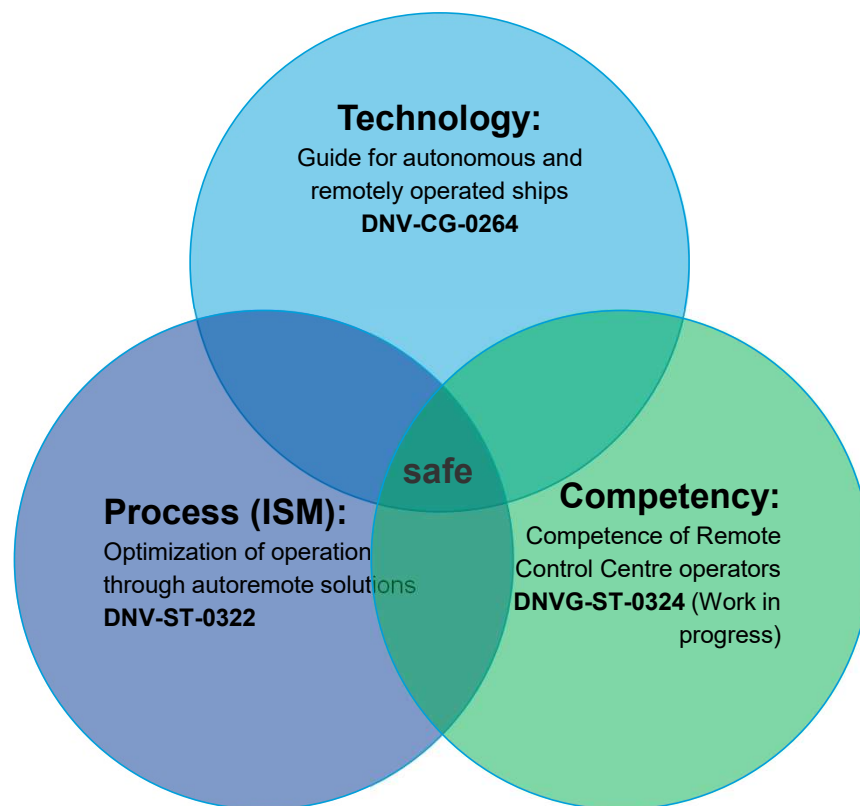


Targeted (smart) testing

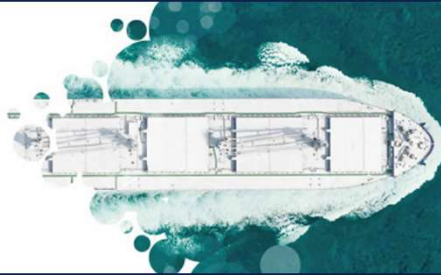


Low fidelity simulations

# Technology alone cannot make the autoremote ship safe



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INTO CONFIDENCE

# Muchas gracias

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[www.dnv.com](http://www.dnv.com)

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Use the **TAB**-key to jump through levels. Click **ENTER**, then **TAB** to switch from one level to the next level

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### Change layout

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Click **Apply to All** or **Apply** if only used on one slide



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Click the **View** tab and set tick mark next to **Guides**

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