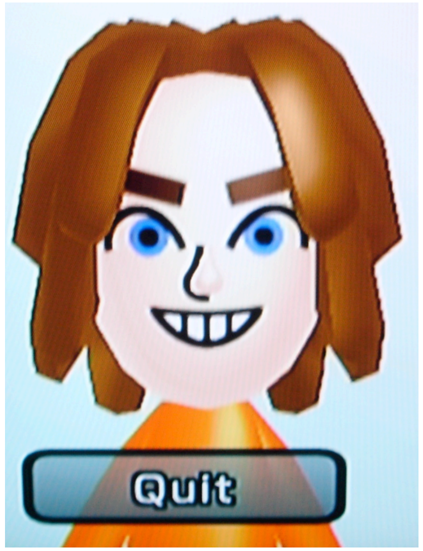
Developing games with COTS

A solution to escalating costs

and expanding deadlines?



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Games have evolved

Gears of War (2006)

Pong (1970)

Super mario 1987

Game development costs

- ★ Technological advances & games showcasing these advances continuously push the boundaries what is to be expected of games.
- ★ Resources required to produce games have significantly increased:
  - 1992: $350.000 | 12 people | 6-12 months
  - 2005: $3M - $10M | 25 people | 18 -24 months
- ★ Price of computer games has remained the same.

Conclusion: you have to sell a lot of games to make a profit.

AAA titles > 500.000 copies

Dilemma

In order to survive game developers must find a way to:

★ *Sell* more games
   - Hits driven: top 99 games (only 3.3% of developed games) accounts for 55% of all sales.
   - Only 1 in 7 games makes a profit.

★ Find a way to lower *costs & development* time
   - Reuse? COTS?

Benefits:

★ Lower cost & development time

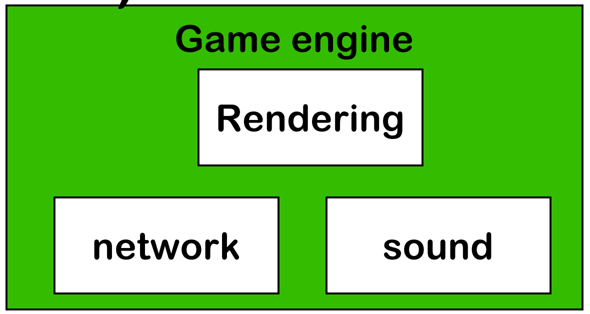
★ Higher quality of COTS & game

★ Advance technology at a faster rate.

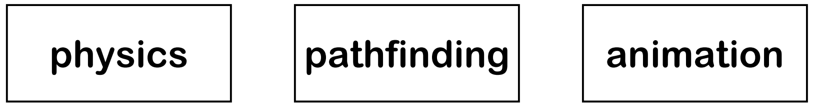
History of COTS

Use of COTS in games not new:

★ Game engines (ID: doom / unreal) have been around for a decade.



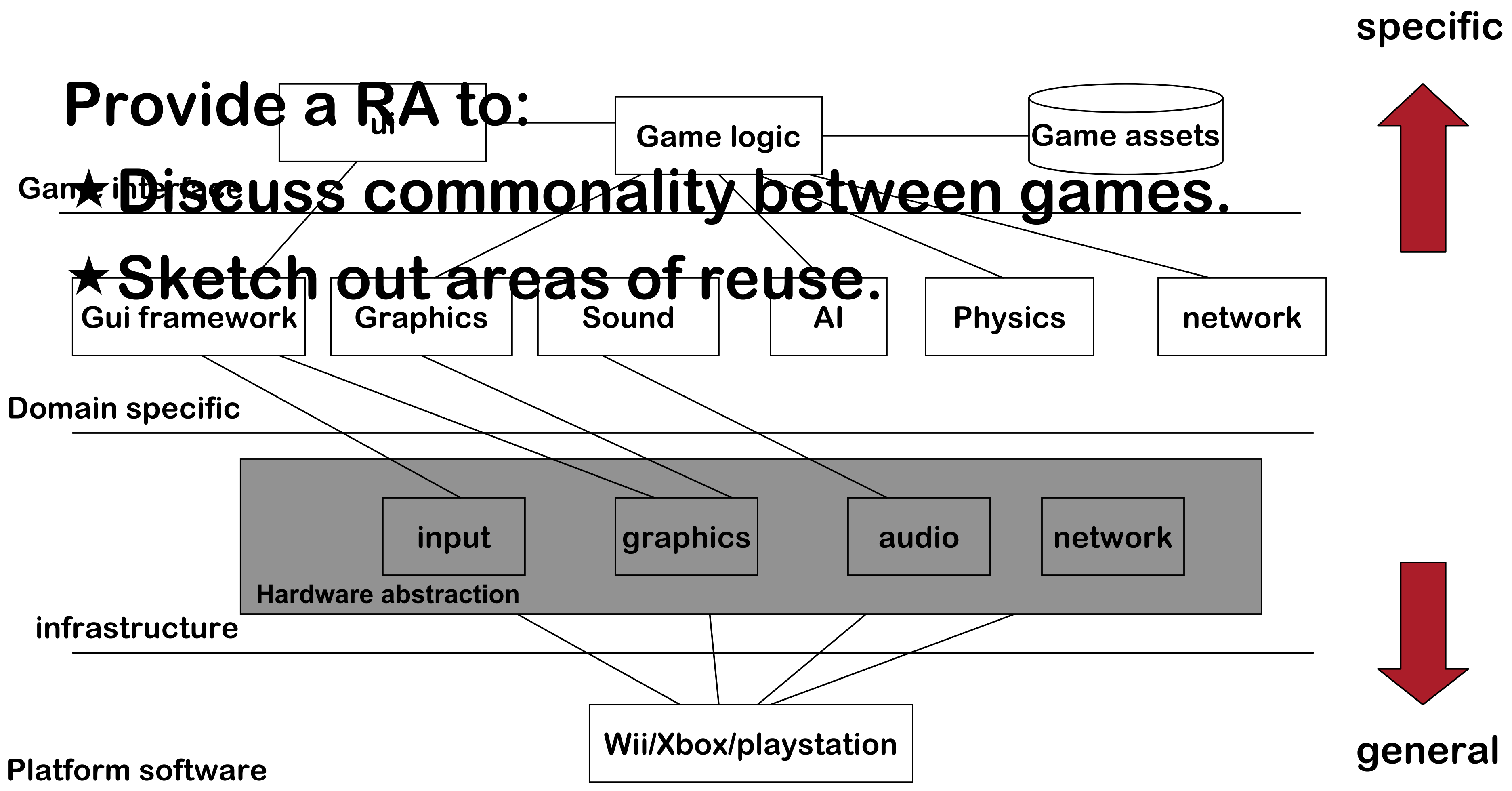
★ Recently: lots of COTS entering the market specialized in less well understood game areas (physics / AI).



Reference Architecture

Provide a RA to:

- ★ Discuss commonality between games.
- ★ Sketch out areas of reuse.



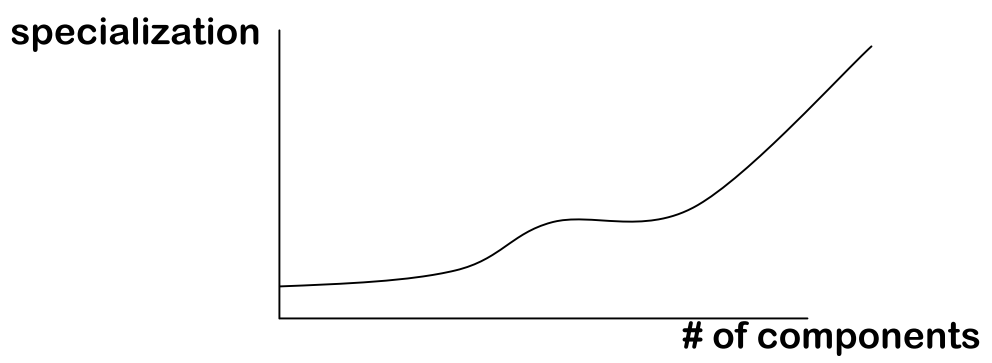
7 ~~Six~~ areas of reuse

- ★ Network ~ server - client communication
- ★ Graphics
  - – Rendering ~ pixelpushing
  - – Modeling ~ managing game objects
  - – Animation ~ creating realistic movement
  - – Texturing & effects ~ bump mapping
- ★ Gui ~ building interfaces
- ★ AI ~ creating the illusion of intelligence
- ★ Physics ~ adhere to newton’s law
- ★ Sound ~ music/sound

Not part of the game but of the “content pipeline”

★TOOLS

Future of COTS?



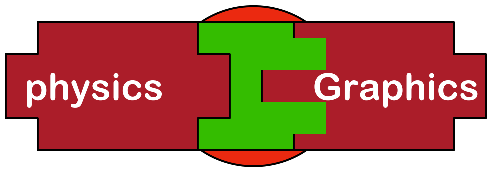
more cots == good

Four problem areas worth further investigating:

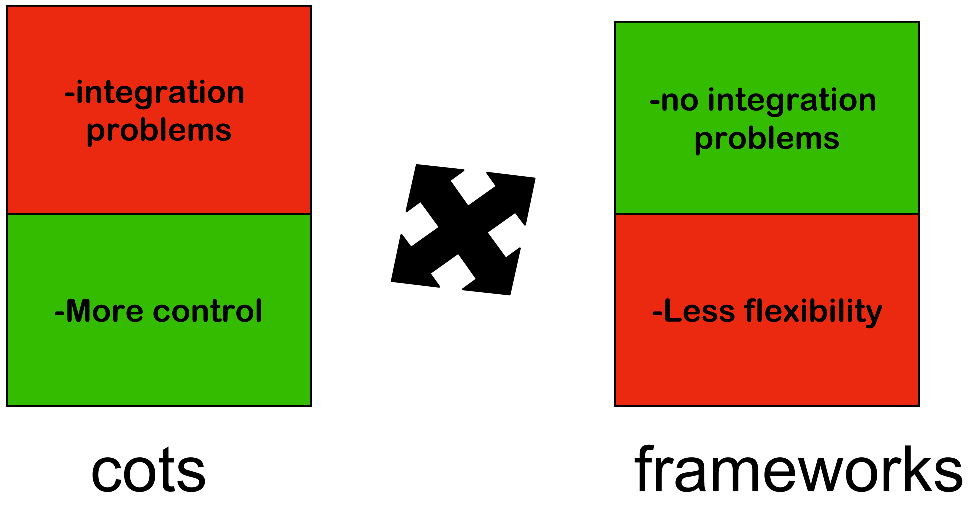
1. COTS vs framework
2. Complexity & SA design
3. The "emerging" architecture
4. Buy or build?

COTS vs Frameworks

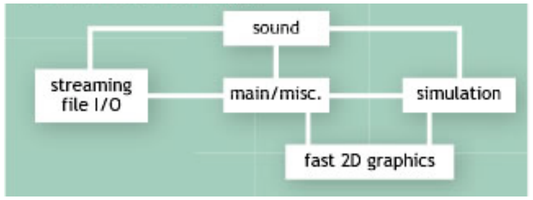
# available COTS increases -> integration becomes a problem.



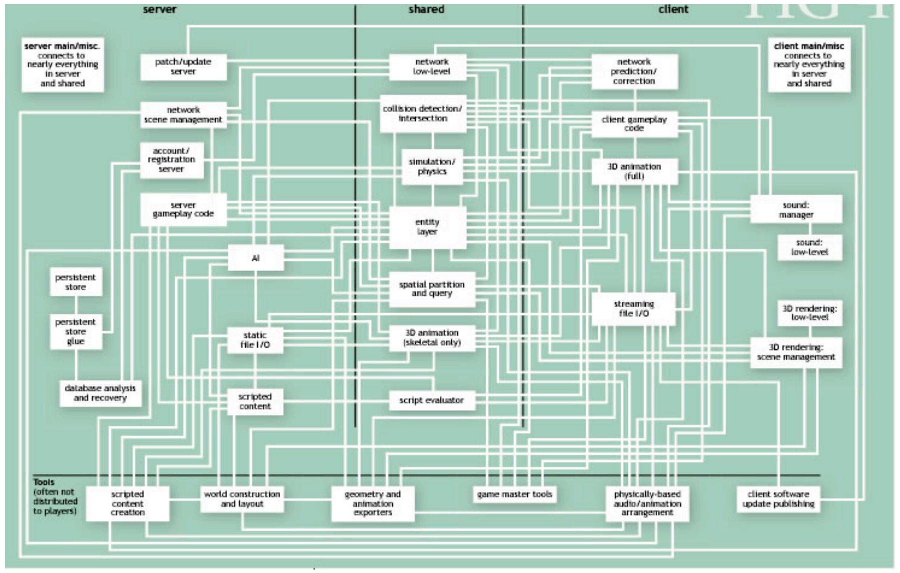
Will game COTS end up like J2EE or .NET?



Complexity & SA design



Game in 1994



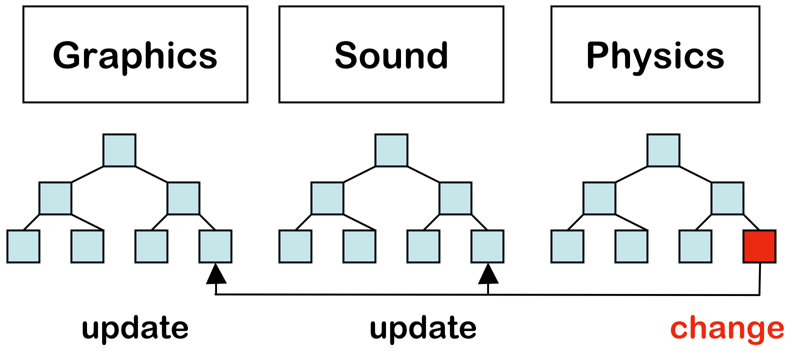
server
shared
client
server main/misc. connects to nearly everything in server and shared
patch/update server
network scene management
account/ registration server
server gameplay code
AI
persistent store
persistent store glue
static file I/O
database analysis and recovery
scripted content
network low-level
collision detection/ intersection
simulation/ physics
entity layer
spatial partition and query
3D animation (skeletal only)
script evaluator
network prediction/ correction
client gameplay code
3D animation (full)
streaming file I/O
client main/misc connects to nearly everything in server and shared
sound: manager
sound: low-level
3D rendering: low-level
3D rendering: scene management
Tools (often not distributed to players)
scripted content creation
world construction and layout
geometry and animation exporters
game master tools
physically-based audio/animation arrangement
client software update publishing

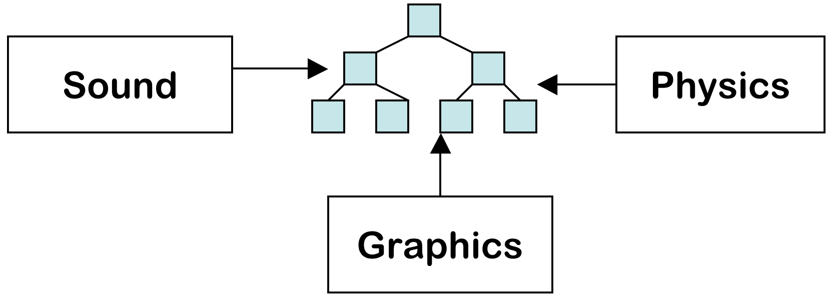
Massive multiplayer game 2005

Complexity mainly due to increase in #components, but also a spaghetti of dependencies making your game Less flexible & expandable.

Causes of complexity

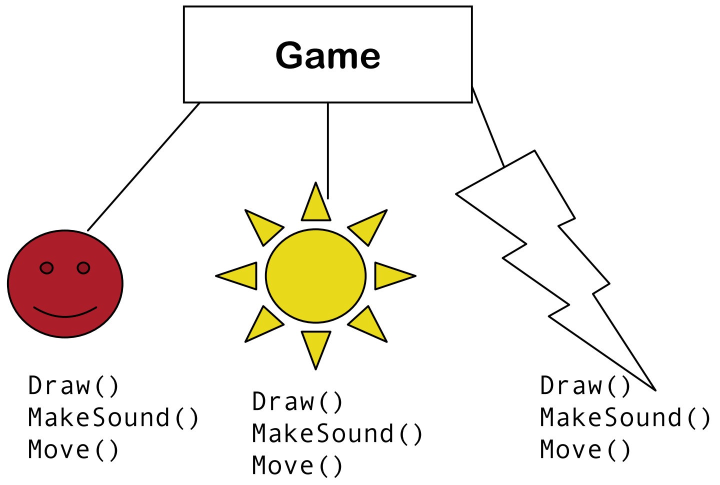
Internal data representation





Better???

Object centric view



```
Draw()
MakeSound()
Move()
```

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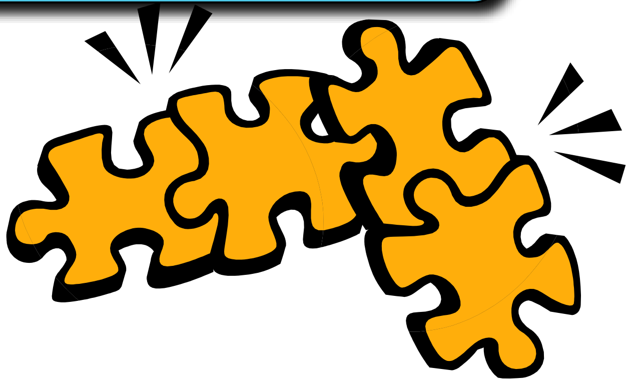
The “emerging” architecture



- ★ Ad hoc design is commonplace.
- ★ An architecture “emerges”
- ★ Architecture may not be optimal for your game

- ★ Connectors play a fundamental role in Achieving Quality
- ★ Needs to be further explored in the domain of games.

Buy or Build?

- ★ How do you know the COTS provides what you need?
- ★ Requires deep knowledge of COTS.
- ★ Game development is explorative with frequently changing requirements.
- ★ Avoid end up rewriting most of the COTS' functionality.

- ★ Guidelines for component selection?
- ★ Increase flexibility while still meeting perf. Req.?

Questions?