University of
South Australia

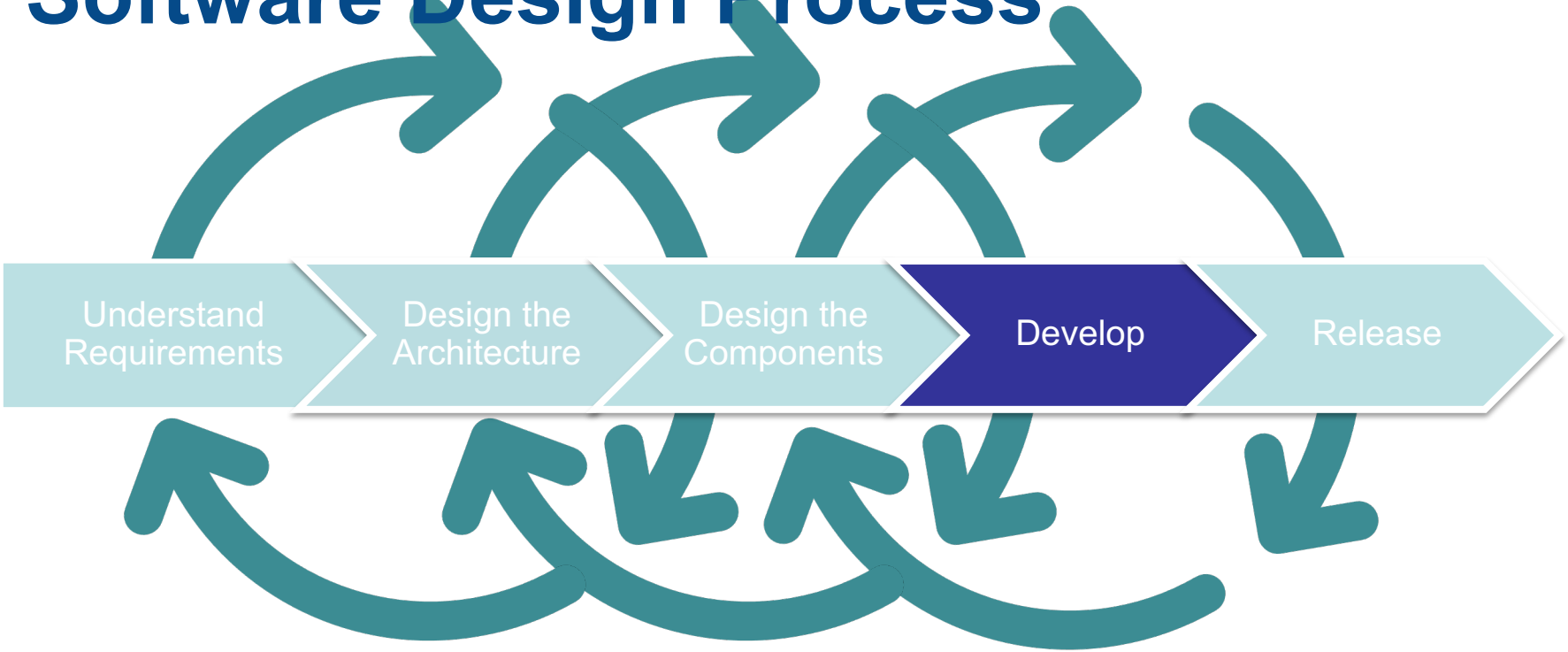
INFS 2044

Workshop 5b Answers

Preparation

- Read the required readings
- Watch the Week 5 Lecture
- Bring a copy of the workshop instructions (this document) to the workshop

Software Design Process



Where We Are At

- Designed components, their interfaces, and their interactions
- Documented implementation design using UML Sequence diagrams and UML Class diagrams
- Assessed designs using Design Principles
- “Repaired” designs using Design Patterns

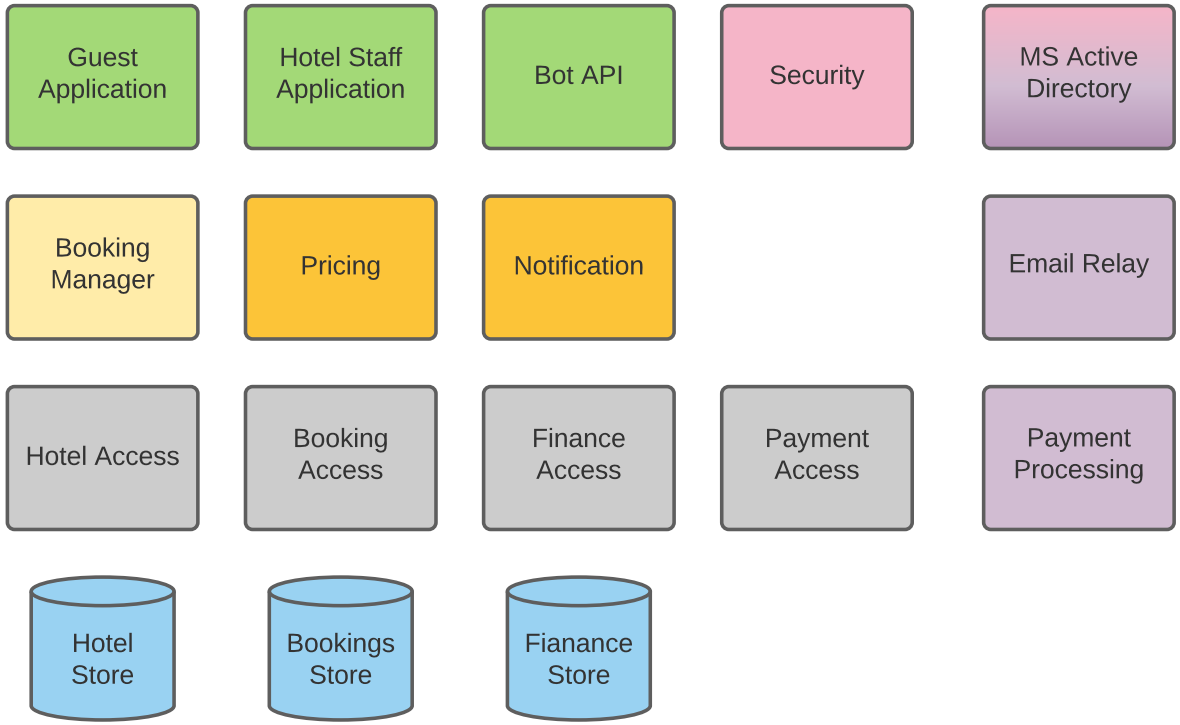
Learning Objectives

- Define components, connectors, and deployment design
- Document deployment design using UML Deployment Diagrams
- Assess non-functional properties of deployment designs

Task 1. Packaging Design

- Define the deployable components for the Booking System.
- Use the decomposition of the Booking System shown on the next slide as the basis for your component design

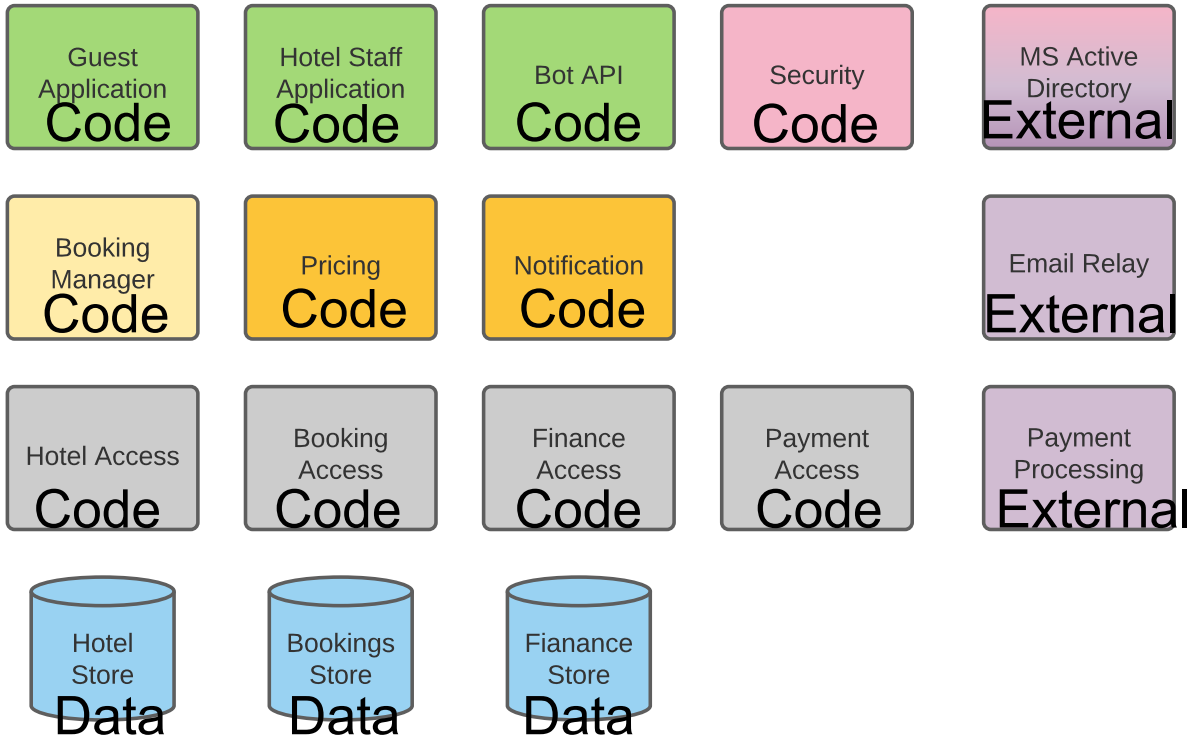
Booking System Components



Packaging Considerations Heuristics

- Which elements in the decomposition shall be packaged as stand-alone elements, and which shall be packaged together with other elements?
- Implementation of the components impact
  - Code-only elements may be aggregated with other elements
  - Data-holding elements may be aggregated, subject to non-functional requirements; may be difficult to duplicate (inconsistencies!)
  - External services are separate by definition

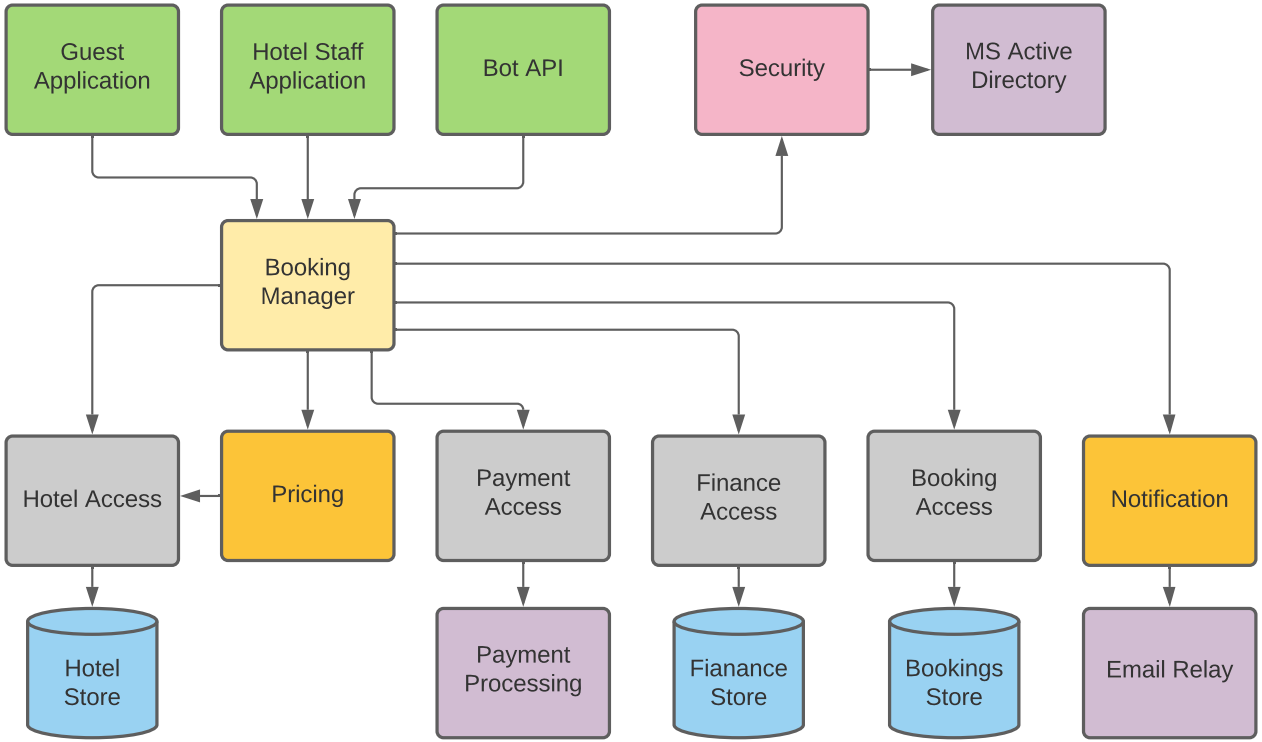
Booking System Components



Packaging Considerations Heuristics

- Coupling
  - <<depends>> Source code dependencies
  - <<use>> relationships
- Non-functional properties impact
  - Communication latency (non-local connectors)
  - Synchronicity of communication (synchronous vs asynchronous)
  - Maintainability (upgrades & patches)
  - Resource constraints
  - Cost (development & deployment)

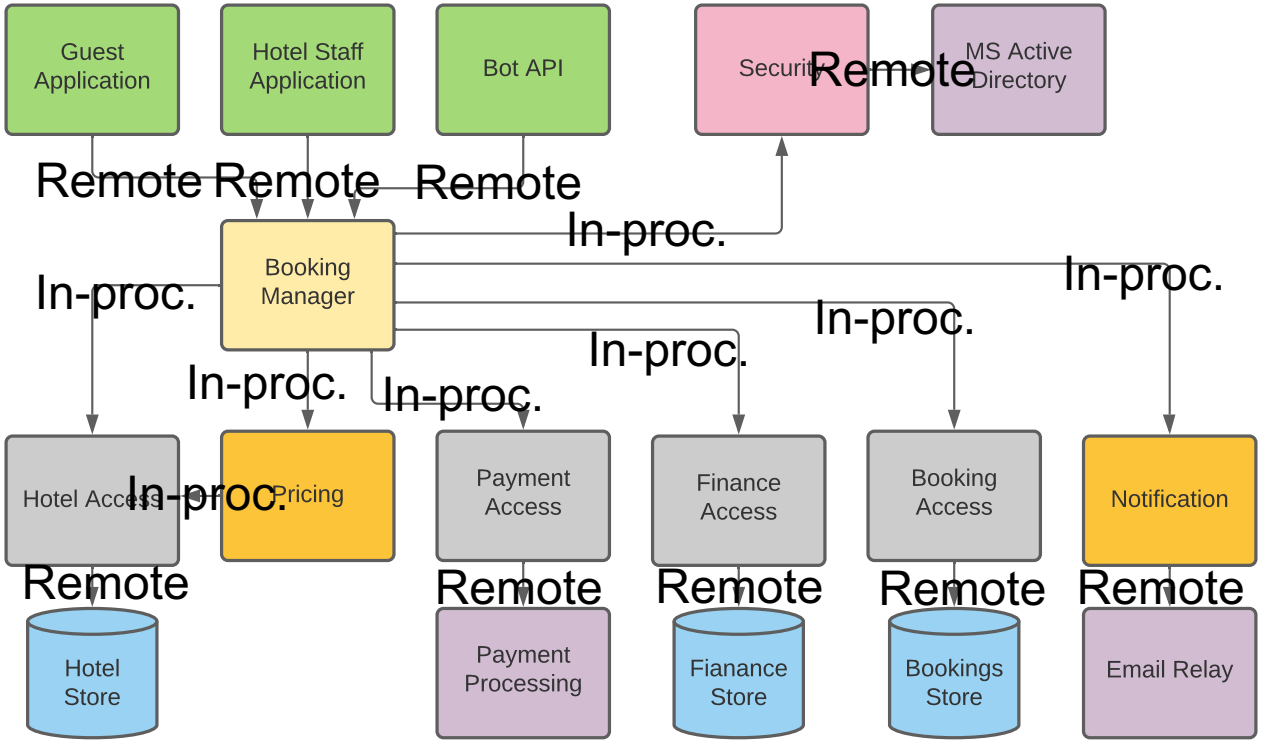
Booking System <<use>> Rels



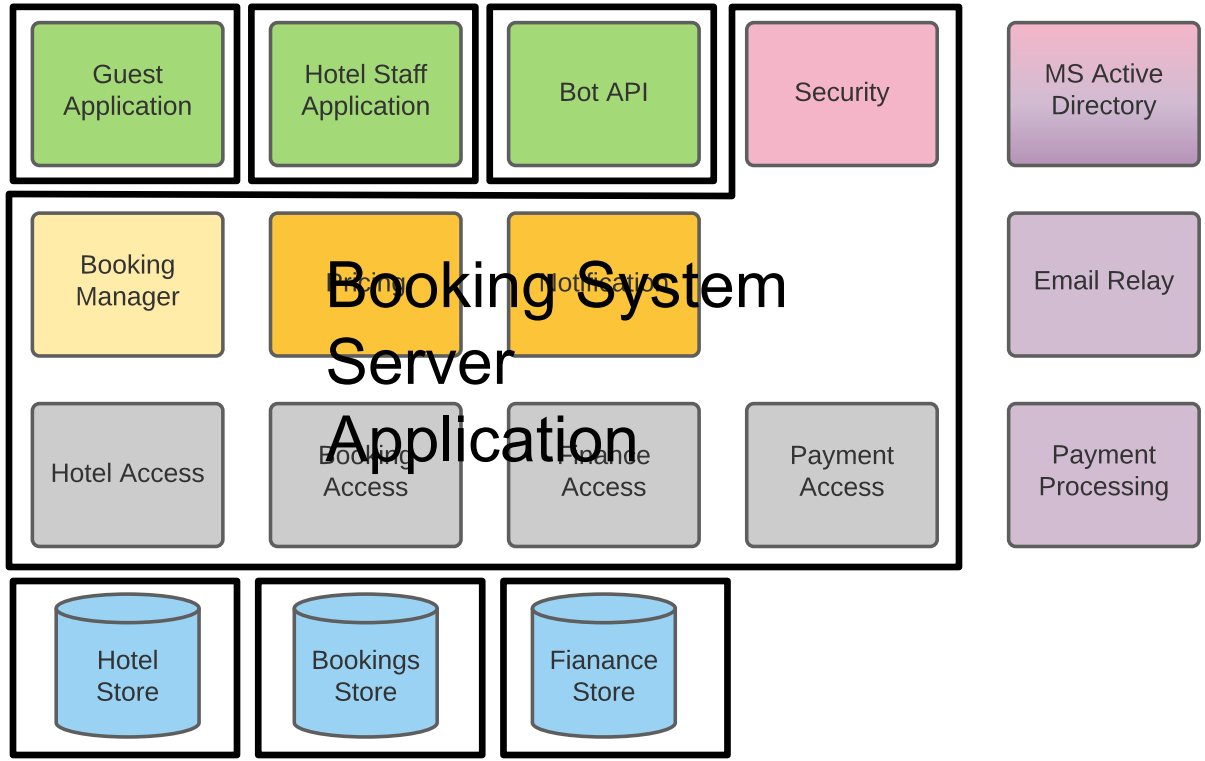
Options for Connectors

- In-process invocation (only if packaged together)
- Inter-process communication on the same host
- Remote invocation
- Queues for asynchronous communication
- There are many options…

Booking System <<use>> Rels



Resulting Runtime Components



Discussion

- All the code-only components have been packaged together
  - Assume that the system implementation components are upgraded together
  - Separation of components may not be worth the extra effort
- We kept the public-facing components separate
  - Each Guest/Staff/Bot application may need to connect to the same Booking System
  - They may be deployed on separate hosts
  - The Booking system cannot be aggregated with these components

Discussion

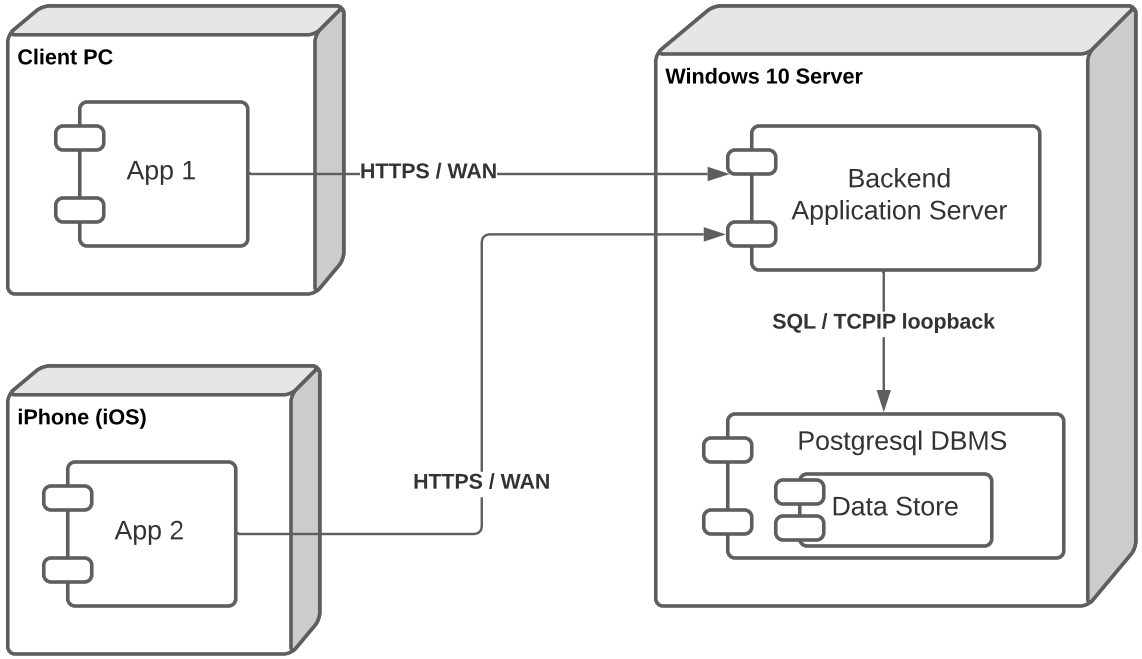
- Data stores kept separate for now.
  - Likely implemented as off-the-shelf DBMS's, hence best separate.
  - Flexibility to decide later how to deploy them (on the same host/DBMS, separate, etc)
- External services are not components in our system.
  - They are separate by definition, someone else runs them for us.

Task 2. Deployment Design

- Create a Deployment Diagram for the Booking System runtime components defined in Task 1.

- Allocate each component to a node, and show how the links and protocols the components use for communication.

UML Deployment Diagram



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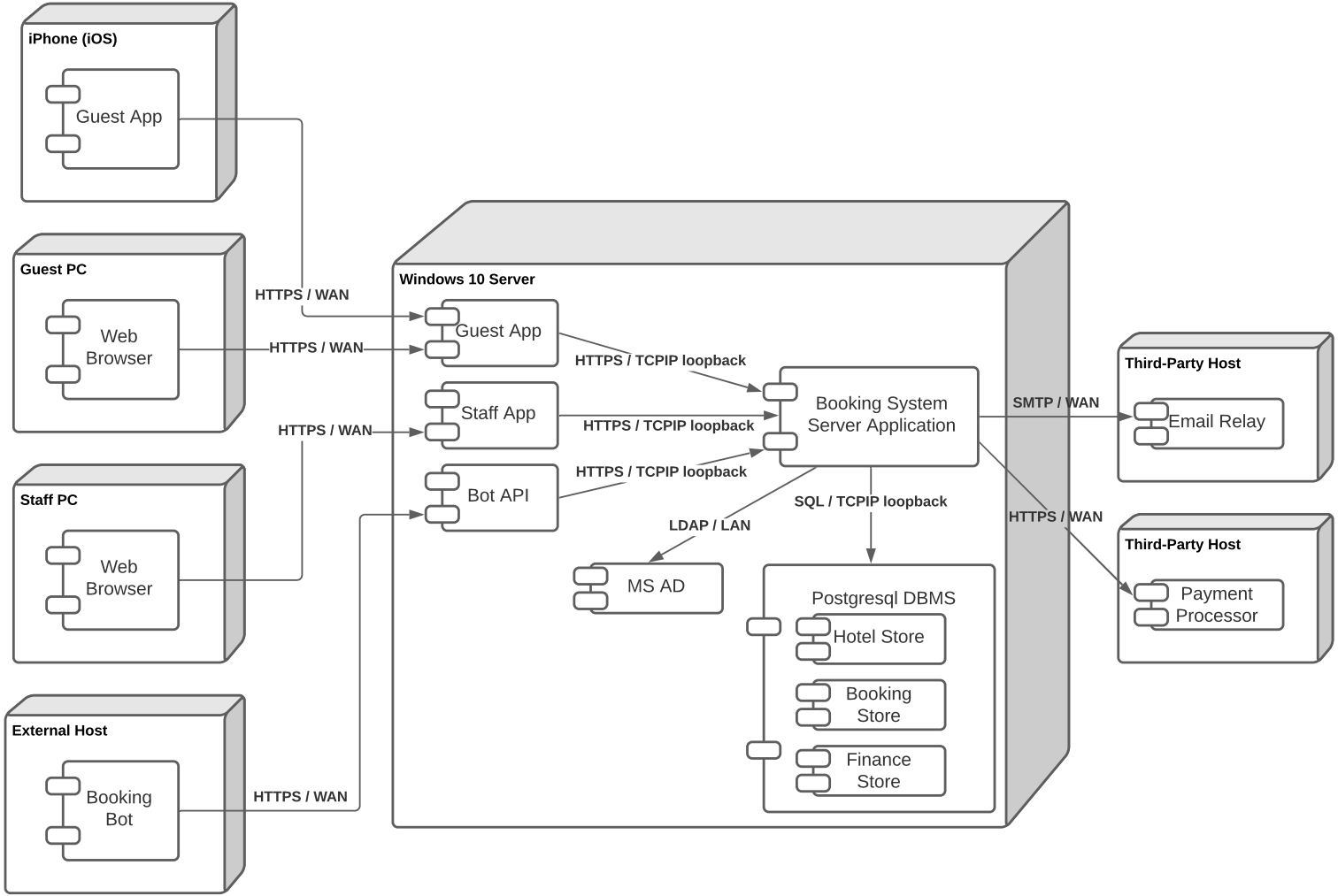
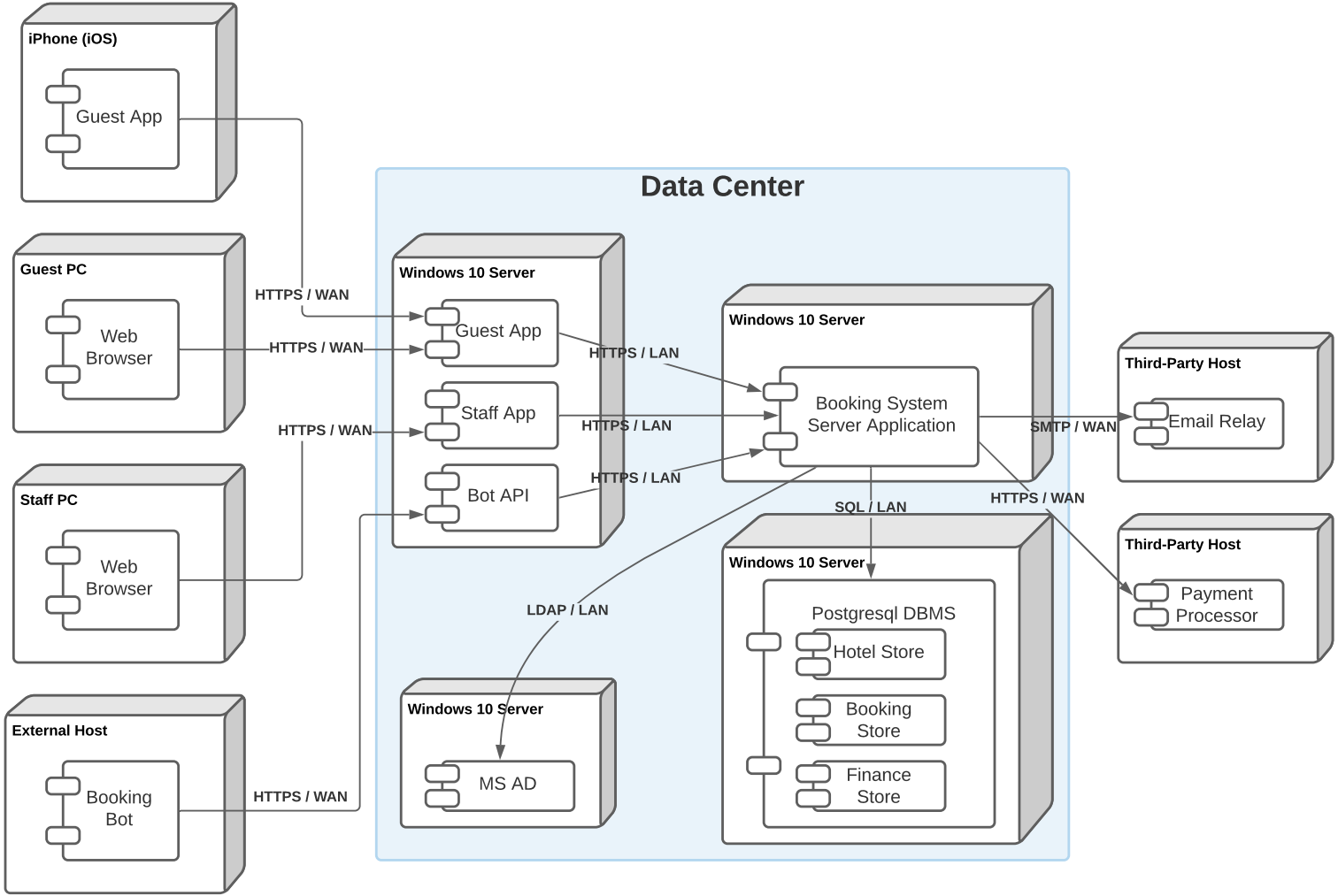

iPhone (iOS)
Guest App
Guest PC
Web Browser
Staff PC
Web Browser
External Host
Booking Bot
HTTPS / WAN
HTTPS / WAN
HTTPS / WAN
HTTPS / WAN
Windows 10 Server
Guest App
Staff App
Bot API
HTTPS / TCPIP loopback
HTTPS / TCPIP loopback
HTTPS / TCPIP loopback
Booking System Server Application
LDAP / LAN
SQL / TCPIP loopback
MS AD
Postgresql DBMS
Hotel Store
Booking Store
Finance Store
SMTP / WAN
HTTPS / WAN
Third-Party Host
Email Relay
Third-Party Host
Payment Processor

Task 3. Non-Functional Properties

- Discuss the non-functional properties of the deployment configuration developed in Task 1.
- Compare the deployment design with that given on the next slide w.r.t:
  - Cost
  - Latency
  - Reliability
  - Maintainability
  - Scalability
  - Security

B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Windows 10 Server
Booking System Server Application
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Payment Processor

Non-Functional Properties

- One Server for Everything
  - Simple
  - Cheap
  - Single point of failure
  - Performance is limited, may not scale easily
  - All is exposed if security is breached

Non-Functional Properties

- Deploy Guest/Staff/Bot application on the same server as the main Booking Application Component, or on a separate server?
  - Separate server is better for security, scalability, maintainability
  - Same server is better for latency (assuming sufficient resources on that node)
  - Latency should not be an issue for access via LAN

Non-Functional Properties

- AD on a separate server is better for security
- Data stores on separate server(s) is better for security
- Guest/Staff/Bot app all on the same server
  - Cheaper, but cannot scale out separately
  - This deployment configuration may change as the system load grows

Non-Functional Properties

- DBMS on the same host as the main system
  - Poor for security (what if the application server gets compromised?)
  - Poor for scalability and reliability (DBMS uses a lot of resources)
  - Cheaper
- All data stores in the same DBMS?
  - Leaner resource profile
  - Separating them makes sense if deployed on separate nodes or if the DBMS technology differs among the stores
  - Separating them is better for data security, but costs more

You Should Know

- Design deployment of components
- Draw UML Deployment Diagrams
- Assess properties of deployment designs

Activities this Week

- Complete Quiz 5
- Continue working on Assignment 1

Next Week

- Attend INFS2045 System Design Studio
- INFS2044 will resume in Week 10

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