IEEE's *Recommended Practice for Architectural Description*

IEEE Architecture Working Group

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Outline

- What is it?
- History
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What Is It?

◆ The IEEE Computer Society has developed IEEE P1471 *Recommended Practice for Architectural Description*

◆ IEEE P1471 is a *recommended practice*

– A "recommended practice" is one kind of IEEE standard

– A using organization must decide whether to, and how to, employ P1471

◆ P1471 applies to Architectural Descriptions

– Architectural Descriptions can be compliant (systems, projects, processes or organizations cannot)

◆ Currently in ballot resolution after first IEEE ballot

Motivation:
Why Architecture?

◆ Why do some systems "succeed"?

◆ Explicitly "architected" systems seem to turn out "faster, better and cheaper"

◆ Architecture is recognized as a critical element in the successful development and evolution of software-intensive systems

Scope of P1471
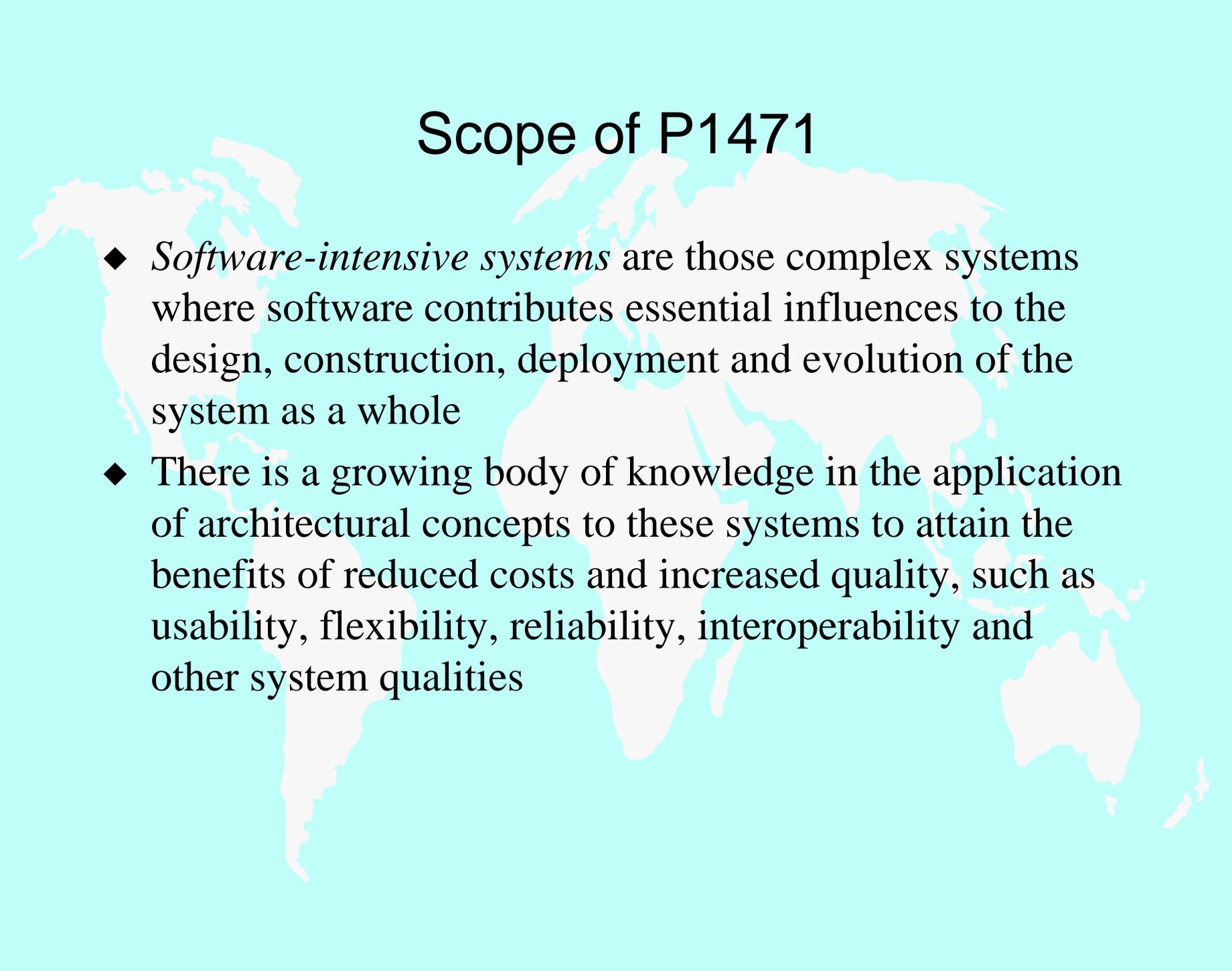
◆ *Software-intensive systems* are those complex systems where software contributes essential influences to the design, construction, deployment and evolution of the system as a whole

◆ There is a growing body of knowledge in the application of architectural concepts to these systems to attain the benefits of reduced costs and increased quality, such as usability, flexibility, reliability, interoperability and other system qualities

History

◆ IEEE Architecture Planning Group:

 – First met August 1995, in Montreal

 – Final report to IEEE Software Engineering Standards Committee, April 1996

 – 6 Participants, 80 reviewers

◆ IEEE Architecture Working Group: May 1996 to present

 – Bi-monthly meetings

 – 29 participants, 137 reviewers
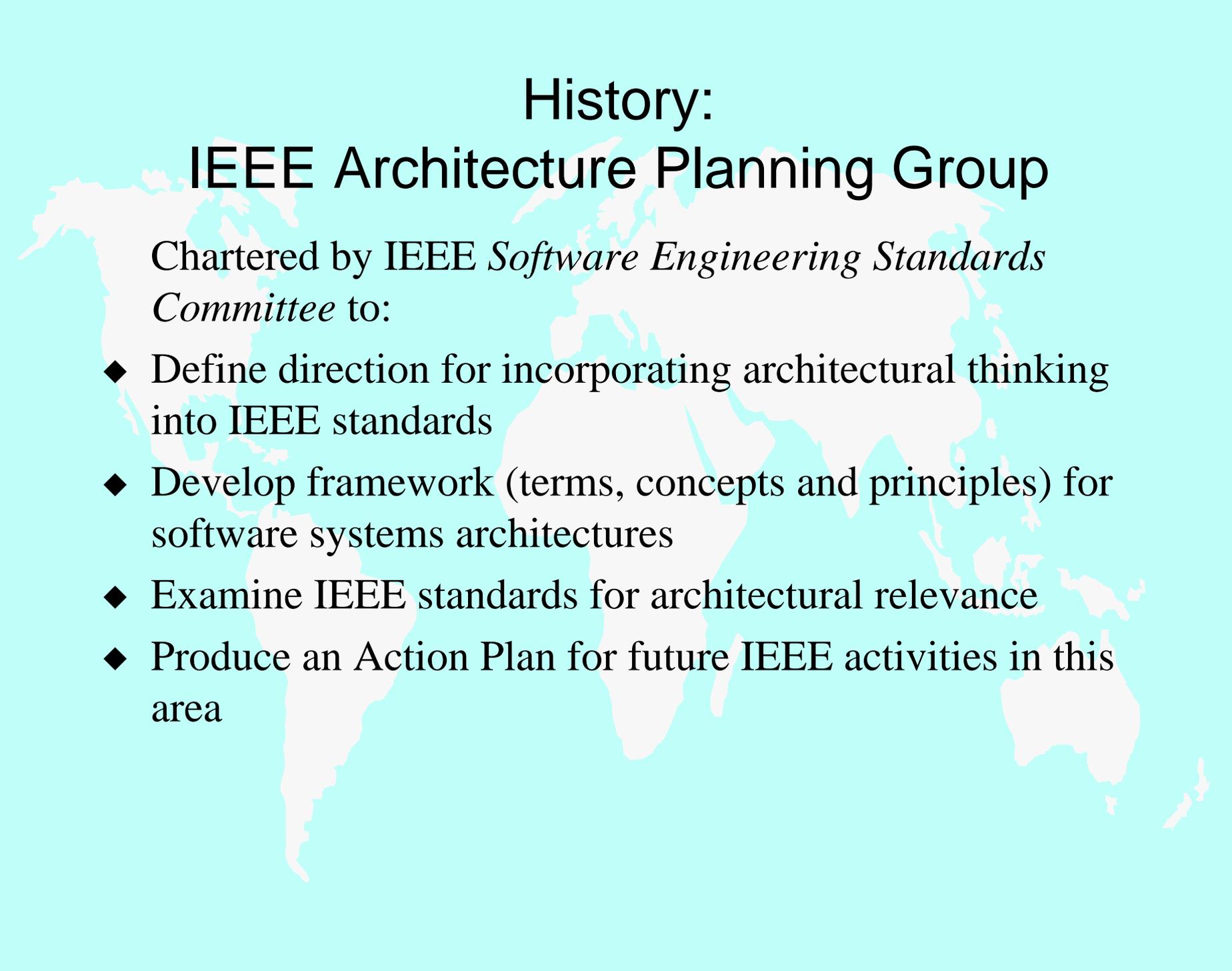
History:
IEEE Architecture Planning Group

Chartered by IEEE *Software Engineering Standards Committee* to:

◆ Define direction for incorporating architectural thinking into IEEE standards

◆ Develop framework (terms, concepts and principles) for software systems architectures

◆ Examine IEEE standards for architectural relevance

◆ Produce an Action Plan for future IEEE activities in this area

IEEE Architecture Working Group: Goals and Objectives

◆ Take a "wide scope" interpretation of architecture as applicable to software-intensive systems

◆ Establish a conceptual framework and vocabulary for talking about architectural issues of systems

◆ Identify and promulgate sound architectural practices

◆ Allow for the evolution of those practices as relevant technologies mature

IEEE Architecture Working Group: Work Activities

◆ Initiated *Recommended Practice for Architectural Description*, and companion *Guide to the Recommended Practice* to address:

– Architectural representation

– Role of architecture in life cycle

– Identification of key stakeholders

– Candidate architectural methods and processes

– Techniques for architectural review and analysis

Using P1471

◆ P1471 is intended for use in a variety of life cycle contexts, e.g.:

◆ Architecture of Single Systems

◆ Iterative Architecture for Evolutionary Systems

◆ Discovering the Architecture of Existing Systems

◆ *life cycle model*: A framework containing the processes, activities, and tasks involved in the development, operation, and maintenance of a software product, spanning the life of the system from the definition of its requirements to the termination of its use. (IEEE/EIA 12207.0)

Organization of P1471
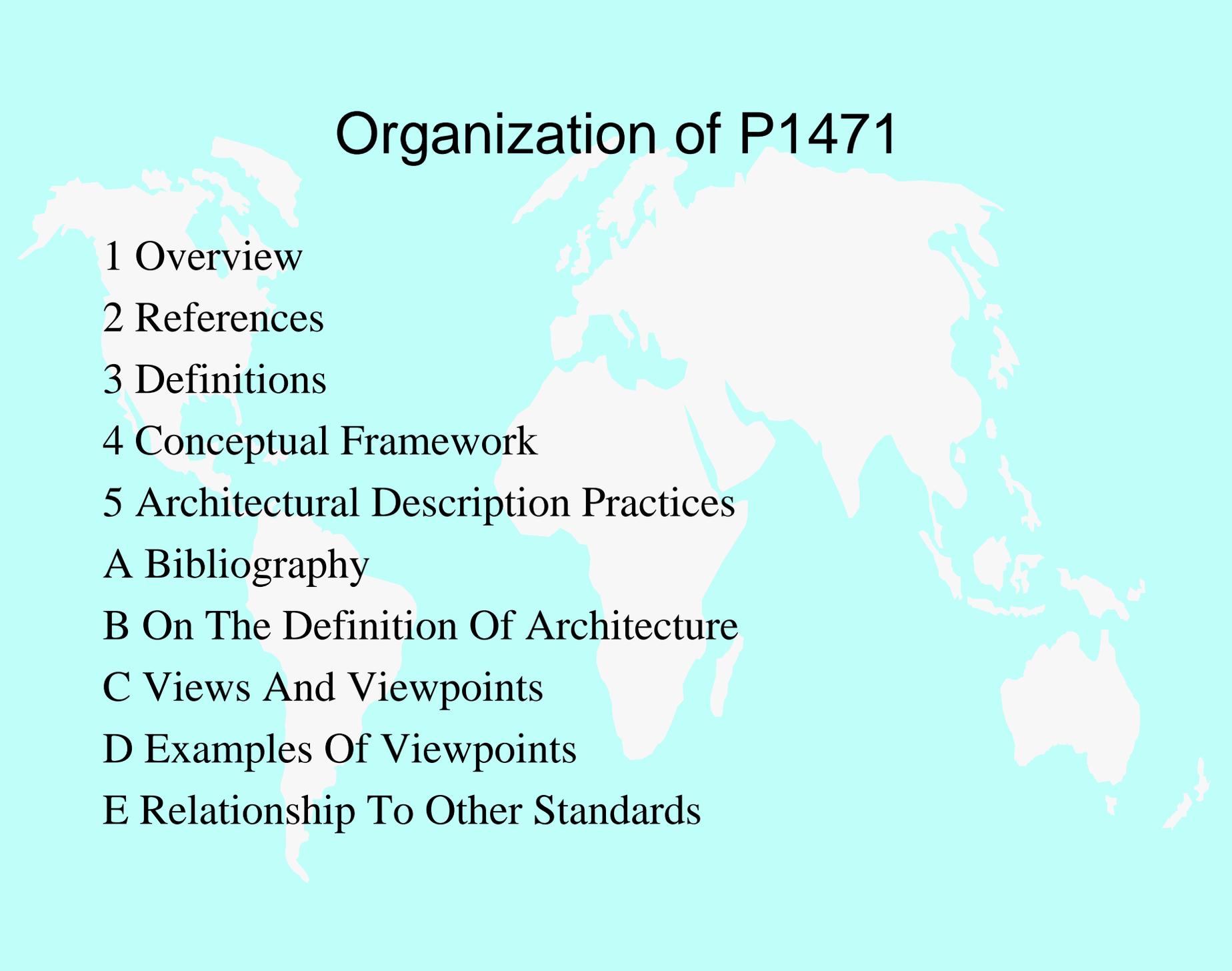
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A Bibliography

B On The Definition Of Architecture

C Views And Viewpoints

D Examples Of Viewpoints

E Relationship To Other Standards

Defining "Architecture"
Current IEEE Definition (vintage 1990)

◆ What is an "architecture"?

Architecture. The organizational structure of a system or component

– IEEE *Glossary of Software Engineering Terminology*, 610.12–1990

Defining "Architecture"
# The P1471 Definition (proposed)

◆ An *architecture* is the highest-level concept of a system in its environment

  where:

  – highest level = essential, unifying concepts and principles

  – system = application, system, platform, system-of-systems, enterprise, product line, ...

  – environment = developmental, operational, programmatic, … context

◆ Every System has an Architecture

Role of the Conceptual Framework

◆ To establish terms and concepts for architectural thinking

◆ To serve as a basis for evolution of the field where little common terminology exists

◆ To provide a means to talk about Architectural Descriptions in the Context of

- System Stakeholders

- Life Cycle

- Uses of Architectural Description

The P1471 Conceptual Framework
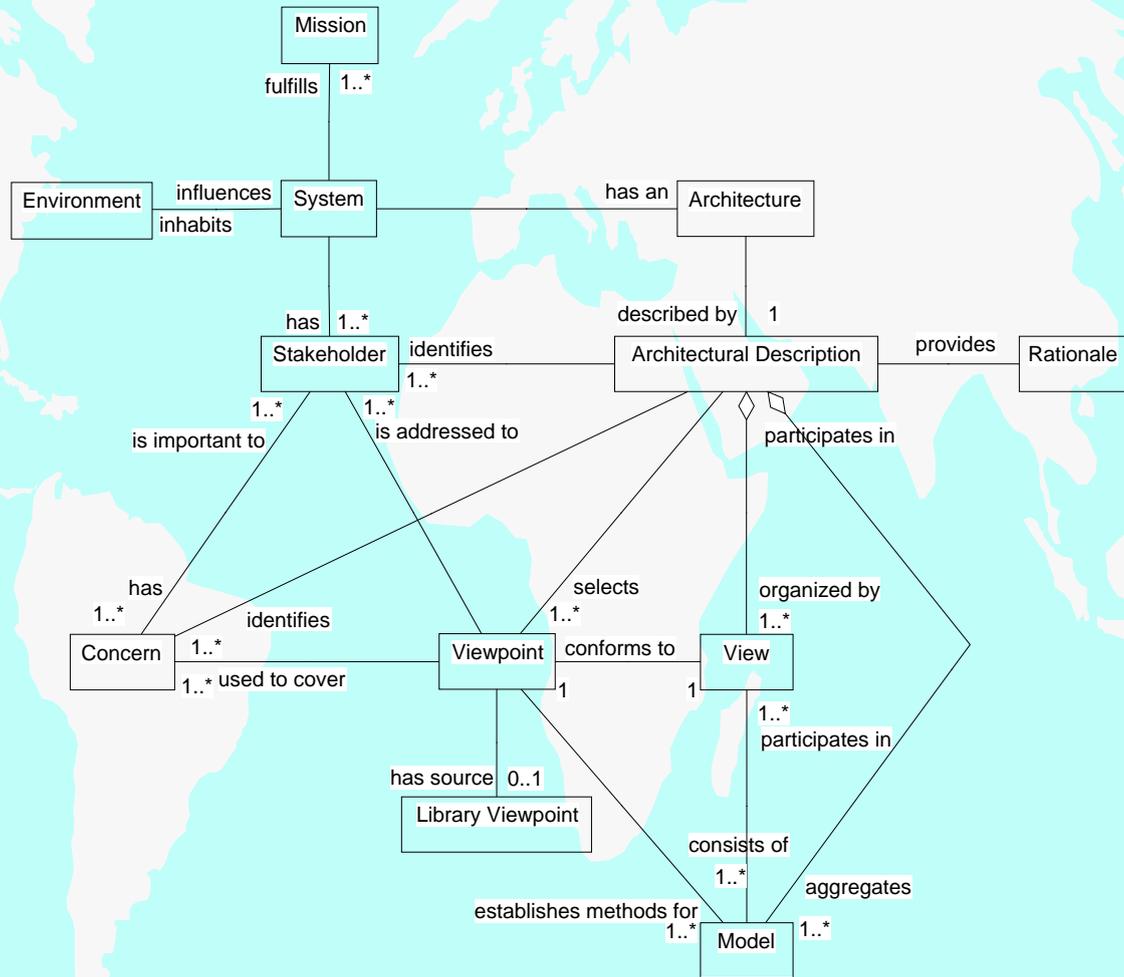
The P1471 Conceptual Framework: Architectural Description

◆ *Architectural Description* (AD): a collection of products to document an architecture

◆ An AD is addressed to one or more Stakeholders to answer their Concerns about the System

◆ An AD is organized into one or more Views of the System

◆ Each View addresses one or more Concerns of the Stakeholders; a View is a way of looking at an architecture

The P1471 Conceptual Framework: Stakeholder, Concern

◆ *Stakeholder*: an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, a system

◆ *Concerns*: those stakeholders' interests which pertain to the development, operation, or other key characteristics of the system (e.g., performance, reliability, security, evolvability, distribution, …)

The P1471 Conceptual Framework: Some Typical System Stakeholders

- Client
- Acquirer
- Owner
- User
- Operator
- Architect
- System Engineer

- Developer
- Designer
- Builder
- Maintainer
- Service Provider
- Vendor
- Subcontractor
- Planner

The P1471 Conceptual Framework: Views

- *View*: a representation of a whole system from the perspective of a related set of concerns
  - The architectural views are the actual description of the system
- Support multiple audiences each with their own concerns
- Reduce perceived complexity through separation of concerns

- views : architectural description :: chapters : book
- Views are not "orthogonal," but each view generally contains new information

The P1471 Conceptual Framework: Viewpoints

◆ A View conforms to a Viewpoint

◆ *Viewpoint*: a pattern or template from which to construct individual views

◆ A viewpoint establishes the purposes and audience for a view and the techniques or methods employed in constructing a view

◆ Some common viewpoints:

– Behavioral: What the system does

– Physical or Structural: How the system is organized

– Management: Plans for construction

– Data or Logical: Relationships among retained data

Reusable Viewpoints
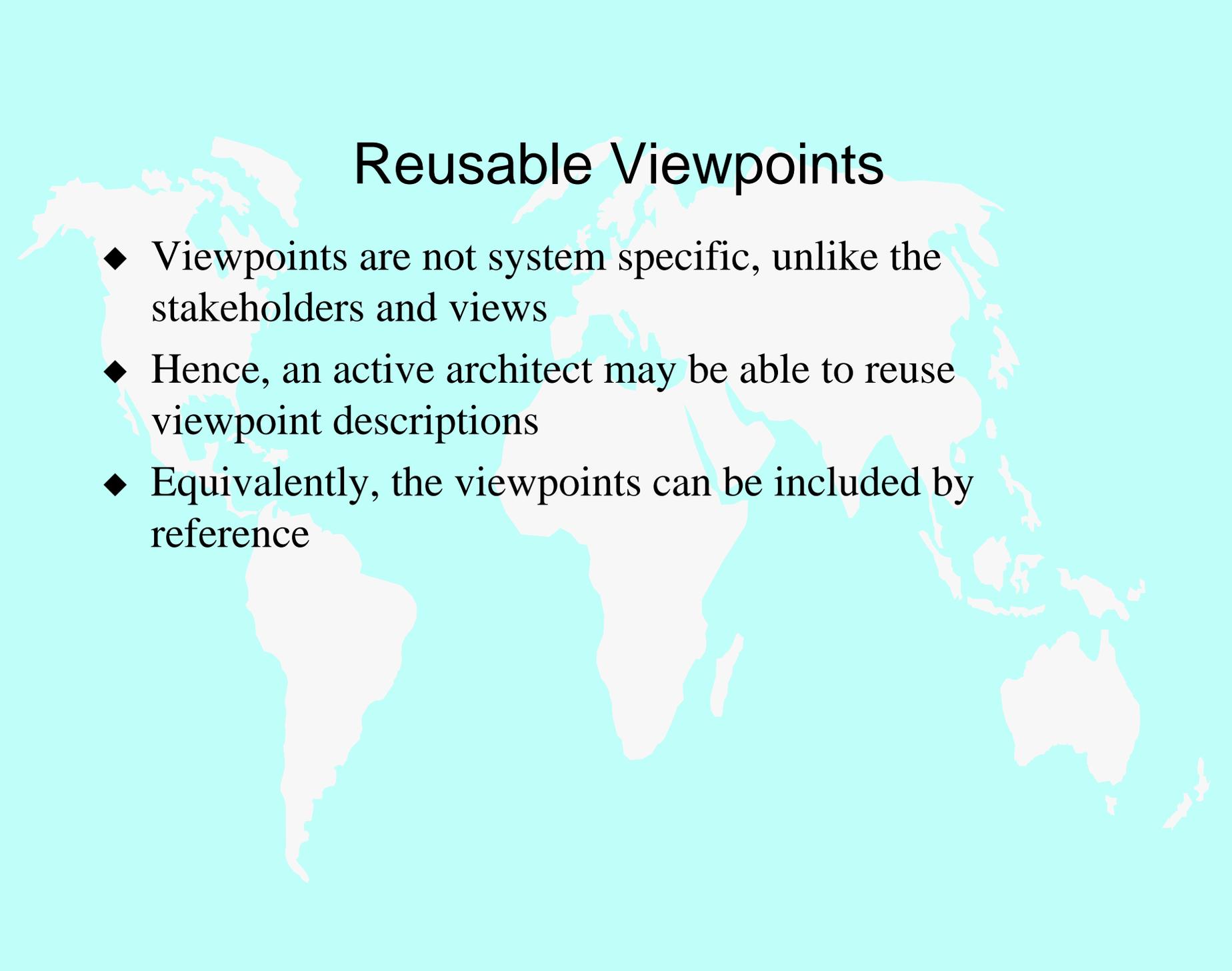
◆ Viewpoints are not system specific, unlike the stakeholders and views

◆ Hence, an active architect may be able to reuse viewpoint descriptions

◆ Equivalently, the viewpoints can be included by reference

P1471 Requirements

◆ P1471 is written in terms of "shall", "should" and "may"
  – To facilitate conformance checking
◆ An Architectural Description (AD) must contain at least the following:
  – Identification of stakeholders and concerns
  – Selection/declaration of viewpoints
  – Architectural views (representation of the system architecture in)
  – Known inconsistencies
  – Rationale

P1471 Requirements:
What isn't Required

◆ No particular architecture description languages

◆ No required views or models

◆ No required formal consistency or completeness criteria

IEEE Architecture Working Group: Current Status and Plans

◆ First ballot was December 1998

◆ Good ballot response, currently in ballot resolution.

◆ Next major effort Guide to the Recommended Practice

◆ Interested reviewers/participants contact:

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◆ AWG web page: http://www.pithecanthropus.com/~awg