# PART I

# GENERAL

## 1. The nature of ice

Several forms of floating ice may be encountered at sea. The most common is that which results from the freezing of the sea surface, namely sea ice. The other forms are river ice and ice of land origin. River ice is encountered in harbours and estuaries where it is kept in motion by tidal streams and normally presents only a temporary hindrance to shipping. Ice of land origin in the form of icebergs is discussed separately below.

Both icebergs and sea ice can be dangerous to shipping and always have an effect on navigation. Sea ice also influences the normal processes of energy exchange between the sea and the air above it. The extent of sea-ice cover can vary significantly from year to year and has a great effect both on adjacent ocean areas and on the weather over large areas of the world. Its distribution is therefore of considerable interest to meteorologists and oceanographers.

### 1.1 Formation and development of sea ice

#### 1.1.1 Ice less than 30 cm thick

The first indication of ice formation is the appearance of small ice spicules or plates in the top few centimeters of the water. These spicules, known as frazil ice, form in large quantities and give the sea an oily appearance. Sea surface temperatures for seawater of normal salinity of 35 psu have to be below -1.8°C. The environmental conditions during the initial stage of sea ice formation affects the type of new ice that develops.

With extreme light winds, and no waves, the frazil ice coalesces to form grease ice, which has a matt appearance. Under near-freezing, but as yet ice-free conditions, snow falling on the surface may result in the sea surface becoming covered by a layer of slush.These forms may be regrouped by the action of wind and waves to form shuga and all are classified as new ice.

With further cooling, sheets of ice rind or nilas are formed, depending on the rate of cooling and on the salinity of the water. Ice rind is formed when water of low salinity freezes into a thin layer of brittle ice which is almost free of salt. Ice rind may be up to 5 cm thick. When water of high salinity freezes, especially if the process is rapid and the wind is very light, the ice has an elastic property which is characteristic of nilas. Nilas is subdivided, according to its thickness, into dark and light nilas; the first one reach thickness of 5 cm, while the second, more advanced stage reaches a maximum thickness of 10 cm. Ice rind, dark and light nilas, may be referred to as nilas ice. Sheets of this have a tendency to raft rather than ridge if pushed together, sometimes interlocking in a distinct finger-rafting pattern.

Alternatively, under turbulent wave action frazil ice at or near the sea surface coalesces to form clumps. These collide with each other, accreting further frazil crystals around the edges. These create a raised rim, and with the clumps developing into rounded floes, give this type of distinctly new ice the name pancake ice. “False” pancake ice may be formed by the breaking up of nilas, or ice rind, due to the action of wind and waves.

Ice rind, nilas or pancake ice may thicken into grey ice and grey-white ice, the first being 10–15 cm thick and the latter attaining thicknesses of up to 30 cm. Ice crystals within these types of ice are randomly orientated due to their frazil ice origin. These forms of ice are referred to collectively as young ice. Rough weather may break this ice up into ice cakes, pancake ice or floes of varying size.

#### 1.1.2 Ice 30 cm – 2 m thick

The next stage of development is known as first-year ice (FY) and is subdivided into thin, medium and thick categories. Thin first-year ice has a thickness of 30–70 cm and is subdivided according to its thickness into thin first-year ice first stage (30–50 cm) and thin first-year ice second stage (50–70 cm). Medium first-year ice has a range of thickness from 70 to 120 cm while in polar areas thick first-year ice may attain a thickness of 2 m or more by the end of the winter. A major characteristic to distinguish first-year ice subdivision is based on the roughness of the surface, thin first-year has smooth surfaces, medium first-year shows incipient ridges and thick first-year surface has fully developed ridges. The ice thickness development is through either vertical downward growth of ice crystals, producing a distinct columnar ice crystal structure distinct from the randomly orientated crystals for the new ice growth, or through snow accumulation on the surface (especially in the Antarctic). The weight of the snow can cause the ice surface to become flooded by seawater that then freezes into a layer of superimposed ice.

#### 1.1.3 Old ice

Thick first-year ice may survive the summer melt season and is then classified as old ice. This category is subdivided into second-year (SY) and multi-year ice (MY) depending on whether the floes have survived one or more summers. The thickness of old ice is normally in the range 1.2 to 5 m or more prior to the onset of the melt season. During the melt season, the ice becomes less saline because of brine drainage and air pockets in the ice are removed. After two summer melts, MY ice is almost free of salt and is very hard. Old ice can often be recognized by a bluish surface colour in contrast to the greenish tinge of first-year ice.

### 1.2 Decay of sea ice

During the winter, the ice usually becomes covered with snow of varying thicknesses. While this snow cover persists, almost 90 per cent of the incoming radiation is reflected back to space. Eventually, however, the snow begins to melt as air temperatures rise above 0°C in early summer and the resulting fresh water forms puddles, called melt ponds, on the surface. These melt ponds absorb (instead of reflect) around 90 per cent of the incoming radiation and rapidly enlarge as they melt the surrounding snow or ice. Eventuall,y the ponds penetrate to the bottom surface of the floes and are known as thawholes. At the same time, salt pockets in the ice enlarge and move downward through the ice. These channels are another path for the ponded water to drain.

This decay process is characteristic of ice in the Arctic Ocean and seas where movement is restricted by the coastline or islands. Where ice is free to drift into warmer waters (e.g. the Antarctic and the Labrador Sea) melt ponds are less prevalent. The warmer air and water temperatures serve to weaken and melt the ice and decay is accelerated by breakup of the floes from wave erosion.

### 1.3 Movement of sea ice

Sea ice is divided into two main types according to its mobility. One type is drift ice, which is continually in motion under the action of wind and current stresses. The other is fast ice, attached to the coast or islands, which does not move.

Wind stress in the drift ice causes the floes to move approximately in a downwind direction. The rate of movement due to wind drift varies not only with the wind speed, but also with the concentration of the drift ice and the extent of deformation (see below). In very open ice (1/10–3/10) and open ice (4/10–6/10), there is much more freedom to respond to the wind than in close ice or pack ice (7/10–8/10) and very close ice (9/10–10/10) where free space is very limited. No water is visible within the compact ice (10/10) or consolidated ice (10/10) where the floes are frozen together. Two percent of the wind speed is a reasonable average for the rate of ice drift caused by the wind in close ice, but much higher rates of ice drift may be encountered in open ice. Due to its momentum, the ice may continue to move even after the wind as stopped.

A force is also exerted on drift ice by currents that are present in the upper layers of the water, whether these are tidal in nature or have a more consistent direction due to other forces. It is usually very difficult to differentiate between wind- and current-induced ice drift but in any case where both are present the resultant motion is always the vector sum of the two. Wind stress normally predominates the short-term movements, particularly in offshore areas, whereas the average long-term transport is dominated by the prevailing surface currents.

### 1.4 Deformation of sea ice

Where the ice is subjected to pressure, its surface becomes deformed. In new and young ice this may result in rafting as one ice floe overrides its neighbor. In thicker ice it leads to the formation of ridges and hummocks according to the pattern of the convergent forces causing the pressure. During the process of ridging and hummocking, when pieces of ice are piled up above the general ice level, large quantities of ice are also forced downward to support the weight of the ice in the ridge or hummock. The underwater parts may be termed respectively ice keel and bummock. The maximum draught of a ridge is mostly three to six times as great as its maximum height but may occasionally exceed a factor of 10. These deformations are thus major impediments to navigation. Freshly-formed ridges are normally less difficult to navigate than older, weathered and consolidated ridges.

### 1.5 Icebergs

Icebergs are large masses of floating freshwater ice derived from glaciers. The underwater mass and draught of an iceberg, compared with its mass and height above water varies widely with different composition and shapes of bergs. The ratio of the underwater to above water mass of an Antarctic iceberg derived from a floating ice shelf is usually less than that of icebergs derived from Greenland glaciers. A typical Antarctic tabular berg, of which the uppermost 10–20 m is composed of old snow, will show one part of its mass above the water to about five parts below. The ratio for an Arctic iceberg, composed almost wholly of ice with much less snow is generally smaller, rather one to seven. However, because of their irregular shape the latter icebergs have a height-to-draught ratio averaging one to three.

Antarctic icebergs may be many nautical miles in diameter and of the tabular category. Through deterioration, other iceberg types, bergy bits and growlers, may be present. In Arctic waters, icebergs are smaller, and icebergs larger than ½ nautical miles are only observed occasionally.

Icebergs diminish in size in three different ways: by calving, by melting, and by combined melting plus erosion caused by wave action. An iceberg is said to calve when a piece breaks off; disturbing its equilibrium and causing it to float at a different angle or capsize. Large underwater projections, which may be difficult to observe, are a usual feature of icebergs in any state. In cold water, melting takes place mainly on the water line while in warm water an iceberg melts mainly from below and calves frequently. It is particularly dangerous to approach an iceberg in this state for it is unstable and may calve or overturn at any time. There are likely to be many growlers and bergy bits around rapidly disintegrating icebergs, which form a particular hazard to navigation.

Icebergs surrounded by sea ice can be protected from waves and be less likely to calve. They can be quite difficult to detect. Since the icebergs tend to be driven by deeper currents, they can move at a different rate than the surrounding sea ice.

Weathered icebergs are poor reflectors of radar pulses and cannot always be detected by such means. Their breakdown fragments – bergy bits and growlers – are even more difficult to detect with ships’ radar for the background clutter from waves and swell often obscures them. These smaller fragments are especially dangerous to shipping for, despite their low profile they represent sufficient mass to damage a vessel that comes into contact with them at normal cruising speed. Some growlers consisting of pure blue ice hardly break the sea surface and are extremely difficult to detect.

Depending on keel depth, icebergs may be grounded for longer periods, but they will typically also travel long distances with drifting sea ice or cold ocean currents. Icebergs and debris ice is a serious hazard in ocean shipping lanes.

## 2. Ice observing methods

Although broad knowledge of the extent of sea-ice cover has been totally revolutionized by satellite imagery, observations from shore stations, ships and aircraft are still essential in establishing the “ground truth” of satellite observations. At present, observations of floating ice depend on instrumental and, to lesser extent, on visual observations. The instrumental observations include coastal radar, airborne radar, electro-magnetic induction sensors, and Synthetic Aperture Radars (SAR). Satellite-borne instruments include visible and infrared imagers, passive microwave radiometers, scatterometers, laser and radar altimeters, and SAR.

The five most important features of floating ice, which affect marine operations, are:

(*a*) Its origin (sea ice or icebergs)

(b) Its thickness (stage of development);

(*c*) The amount present – for sea ice, the concentration, usually estimated according to the tenths or percentage of the sea surface covered by the ice; and for icebergs, the size and shape of the iceberg;

(d) The form of the ice, whether it is fast or drift ice and the size of the constituent floes; and

(e) Any movement of the ice.

From the bridge of a ship 10 m above the sea, the horizon is about 12 km away, and observations can cover a radius of 7–8 km. From the top of a coastal lighthouse 100 m above the sea, the visual range is almost 40 km, and the observation may then cover a radius of 20 km.

Shore locations may provide an ice report several times a day as the ice changes in response to wind and current but the total area of ice being reported is very small. From a ship progressing through the ice, a summary report of the ice encountered during daylight progress may represent an area of the sea ice 15 km wide and 100 km long (assuming a ship’s speed of approximately 5 kts). In some marine areas, such as the Baltic Sea, coastal settlements, lighthouses and ships may be present in sufficient numbers that a reasonable proportion of the ice cover can be reported each day by an organized surface network. In others, such as the Gulf of St Lawrence, where the waterways are broad and the shores often unsettled, the shore reporting system can only provide data on a small percentage of the total ice cover. Surface based reports can provide excellent detail about the ice, especially its thickness,.

Reports about the ice cover taken from the air, i.e. helicopters and fixed-wing aircraft, have the advantage of a much better viewing angle; the platform’s flying speed allows a great deal more of the sea ice or icebergs to be reported; and problems of remoteness can be overcome by using long-range aircraft. Trained ice observers can recognize the various stages of development of sea ice, estimate its amount, note its deformation and the snow cover or stage of decay. For icebergs, these ice observers can determine size and shape of the icebergs which is critical for accurate drift and deterioration modeling.

Comprehensive aerial reporting has its own particular requirements beginning with an accurate navigational system when out of sight of land. Inclement weather – fog, precipitation and low cloud – will restrict or interrupt the visual observations and the usual problems of flying limits at the aircraft base may also be a factor even if the weather over the ice is adequate for observing.

Recent advances in technology are now permitting more precise data to be obtained by aerial observations. Sophisticated radar systems used with real aperture, SAR, and inverse SAR modes can provide information, which documents precisely the distribution and nature of the ice 360 degrees around the flight path of the aircraft for distances of up to 100 km. Unlike most other sensors, the radar has the capability of monitoring the ice under nearly all weather conditions. It responds mainly to the roughness of the ice surface but the dielectric properties of each ice floe also affect the response.

When no fog or low clouds are present, a laser airborne profilometer can be used to measure the height and frequency of ridges on the ice, and under similar conditions an infra-red airborne scanning system can provide excellent information with regard to floe thickness in the ranges below 30 cm.

Earth-orbiting satellites are the predominant mode of observing sea ice but again there are some restrictions. The spectral range of the sensors may be visible, infrared, passive or active microwave or a combination of these. Satellite coverage may be broad at low resolution or cover a narrow swath at high resolution. The higher the resolution, the smaller is the area that can be imaged and the less frequent an area can be re-sampled.

In general, most meteorological satellites provide complete coverage of polar regions once or twice a day. These satellites provide visible and infrared imagery with resolutions of 250 m–1 km (NOAA AVHRR, and Visible Infrared Imaging Radiometer and Suite VIIRS, METEOR, MODIS, DMSP OLS, Sentinel-3); and passive microwave and scatterometer data at coarser resolutions of 6–70 km (AMSR2, NOAA AMSU, DMSP SSMIS,ASCAT). Visible and infrared data do not have cloud-penetrating capability while microwave data are practically cloud independent. Active microwave SAR data (RADARSAT-2, Sentinel-1, TerraSAR-X, COSMO-SkyMed, and ALOS-2) are characterized by improved ground resolution (approximately 10–100 m) but a reduced coverage due to narrow swaths and greater revisit time between exact repeat orbits. Ice services are also starting to use data from radar altimetry satellites such as Cryosat and Sentinel-3 and high resolution (30 m or better) optical imagery from Sentinel-2.

Spaceborne sensors can provide precise data on the location and type of ice boundary, concentration or concentration amounts (in tenths or percentages) and the presence or absence of leads, including their characteristics, if radar sensors are used. Less accurate information is provided on the stages of development of the sea ice including the FY/MY ratio, forms, with an indication of whether ice is land-fast or drifting, stages of ice melting and ice surface roughness. Floe motion over approximately 12–24-hour intervals can often be determined through the use of imagery from sequential orbits.

Manual or visual interpretation of imagery from visible and infrared sensors requires a certain amount of skill, for example, a picture element composed of 50 per cent white ice and 50 per cent water will have the same greyness in the visible image as another element in which the whole surface is covered with thin (grey) ice. Snow cover on the ice and puddles on the floes are other complicating factors. Interpretation of SAR images may be even more difficult due to the ambiguities associated with SAR backscatter from sea-ice features that vary by season and geographic region. This has been helped with SAR satellites having dual or full polarimetry modes of operations, the cross-polarisation channels being better for distinguishing between areas of sea ice and open water. In recent years there has been a focus on automated digital processing techniques for aiding the interpretation of satellite data. Techniques are usually implemented within geographical information systems (GIS) and include automatic and/or interactive image georeference, enhancement and various types of image recognition and classification, which are based on data from a single sensor or combination from several ones.

## 3. Integrated observational systems

Any well-designed ice service system must consist of three major components:

(*a*) A surface observation network consisting of *in situ* reports and remotely sensed data;

(*b*) A communication system to gather and distribute the ice information; and

(*c*) A digital data integration, analysis and production system.

Surface reports from shore stations, ships and drifting buoys provide accurate information on ice amount, thickness, motion and its deformation over rather small areas. When many vessels and fixed observing points are available accurate information can be provided in restricted waterways. Many areas of the Kattegat and Baltic Sea coastline fall into this category and landline facilities are available for the relay of these reports to national or regional centres.

When waterways are more open or more remote from populated areas, either satellite data or aerial observations must be integrated into the system. Aerial data are normally prepared by the observers in map format as they fly along the prescribed track. An air-to-ship communication line is needed to pass the data directly to vessels in the area. This may be merely a voice channel, a radio facsimile broadcast or a digital network link, which enables radar data or the ice chart itself to be passed to the ships. In most cases, these data are also passed to the ice centre for integration into regional-scale analysis products.

Satellite data are typically passed in real-time (less than six hours) from satellite ground stations to the ice centres via high-speed communication links. Visible, infrared, passive microwave, SAR data are then digitally processed, integrated with meteorological guidance products and ice model output and then analysed by computer, typically using GIS. Image enhancement techniques and various other automated algorithms are often employed in the production of an ice analysis.

Ice analyses are produced as charts at varying scales (typically ranging up to 1:2,500,000) depending on the size of the area and the level of detail required. The ice charts are made available as data coverages in GIS formats and/ or as simple electronic charts in such graphic formats as GIF or PNG, which can be viewed with almost any web browser or graphics viewer. Charts are typically labelled and coloured using the WMO international sea-ice symbology (WMO-No. 259) and *Ice Chart Colour Code Standard* (WMO-TD-No. 1214). Other ice analysis products include annotated satellite imagery, usually in JPEG and TIFF formats, text messages and electronic charts.

## 4. Ice information services

The observed ice data can also be combined with meteorological and oceanographic parameters in a prediction model to provide further guidance to vessels in or near the ice.

Usually, ice forecasts are prepared once a day for a period of 24 to 144 hours. These are tactical forecasts, which may provide advice on difficult ice conditions forming or dissipating, the general motion of the pack, opening and closing of leads, etc. They are strongly influenced by meteorological prediction and should always be used in concert with the weather forecast.

Other longer-range predictions – those covering periods from 7–10 days to 30 days and seasonal predictions – are usually based on climatological and analogue methods.

Ice information that has been collected over a long period of time can be used for climatological purposes. Information such as the average ice concentration at different times or the average ice stage of development can be provided. This information can be used for planning.

Relay of charts of operational ice conditions is mostly conducted by radio facsimile or via a digital network link. Time slots and schedules usually dictate the scale and number of charts provided by the broadcast station in the area of concern. Direct broadcast by the ice centre or communication stations is ideal and occurs when feasible. Many ice charts and other ice information is available on the internet.

## 5. International cooperation

In some areas of the world a regional approach to ice services is far more economical and efficient than one based solely on national facilities. For example, in 2003, the USA and Canada established a joint service know as the North American Ice Service (NAIS). The NAIS is composed of the Canadian Ice Service (CIS), the US National Ice Center (NIC), and the USCG International Ice Patrol (IIP). Detailed information on NAIS joint products is provided in Part II below. The similar Baltic Sea Ice Services (BSIS) is under steady development and includes informational exchange between Denmark, Estonia, Germany, Finland, Latvia, Lithuania, the Netherlands, Norway, Poland, the Russian Federation and Sweden. A common numerical ice-reporting code (the Baltic Sea Ice Code), sea-ice charts (international sea-ice symbols), integrated data broadcasts in English and similar shipping control regulations are used. In Finland and Sweden, icebreaker assistance is integrated in the Gulf of Bothnia. In special situations, such as when the Baltic Sea is totally ice covered, all icebreaker assistance in the Baltic Sea is integrated, with the common aim of supporting marine traffic. This is done under the development of BIM (Baltic Icebreaking Management), which is the cooperation body of the Baltic Sea icebreaking organizations. Within Europe, the ice services of Denmark, Finland, Iceland, Norway and Sweden have a similar agreement in the form of the European Ice Services (EIS). The European Union Copernicus Marine Environment Monitoring Service (CMEMS), previously the Global Monitoring for Environment and Security (GMES) programme includes partners from national services as well as from research and industrial communities and is aimed at the implementation of a coherent operational oceanography system for the high latitudes, consisting of sea ice, meteorological and oceanographic services.

On a larger scale, the WMO/IOC JCOMM Expert Team on Sea Ice (ETSI) has been instrumental in developing an internationally accepted terminology, formats to exchange operational and archived data on sea ice, and other guidance material. To this effect, the ETSI also collaborates with other international sea-ice groups – the International Ice Charting Working Group (IICWG) and the Baltic Sea Ice Meeting (BSIM). The international sea-ice terminology including an illustrated glossary and a set of chart symbols was developed and first published in 1971 in English, French, Russian and Spanish (*WMO Sea-Ice Nomenclature*, WMO-No. 259) with the latest additions and corrections introduced in 2017. From November 2004 an electronic version of the nomenclature (predefined English, French, Russian and Spanish versions in alphabetic/subject order, equivalents, search/selection option), is available (<http://www.aari.nw.ru/gdsidb/XML/wmo_259.php>).

A set of formats was designed in 1980s-1990s for the archive mode sea-ice information exchange (SIGRID, WMO 1989, SIGRID-2, WMO 1994).

Further, in cooperation with IICWG, two JCOMM Technical Report Series documents – SIGRID-3: *A Vector Archive Format for Sea Ice Georeferenced Information And* *Data* (WMO/TD-No. 1214) and *Ice Chart Colour Code Standard* (WMO/TD-No. 1214) were prepared and issued in 2004 with the latest additions introduced in March 2017.

# The ETSI in March 2007 adopted the “Ice Objects Catalogue” version 4.0” (JCOMM TR-No.80) as the sea ice extension of the IHO S-57 format for the ENCs and agreed on a formal mechanism for its maintenance and development with JCOMM ETSI recognized as the competent international technical group on sea ice and icebergs by the WMO, IOC and IHO Committee on Hydrographic Requirements and Information Systems (CHRIS), the WMO Secretariat as Register Owner and Manager, Register Users as anyone interested in sea ice or iceberg MIOs, the Control Body as the ETSI ENC Ice Objects Task Group (TG ENCIO), the Submitting Organization as WMO and proposers as ETSI Members from Canada, Germany, Russian Federation and USA. The latest 5.2.1 version of the document adopted in March 2017 is now available within the IHO Register of Registers. In March 2014, based on the “Ice Object Catalogue” the “S-411 Ice Information Product Specification” (JCOMM TR-No.81) has been produced by the BSH as part of JCOMM/ETSI in response to a requirement to produce an ice data product that can be used within Electronic Chart Display and Information Systems (ECDIS). The Ice Information product specification is based on the IHO S-100 framework specification, Geography Markup Language (GML) Encoding Standard and the ISO 19100 series of standards. It is a vector product specification that is primarily intended for encoding the extent and nature of Sea Ice for navigational purpose.

All specified documents are in electronic form from the JCOMM Sea-Ice regulatory documents web page <http://jcomm.info/index.php?option=com_oe&task=viewDoclistRecord&doclistID=160>

Until the 1980s, most ice services were directed towards shipping and offshore exploration. As a result, the needs were very specific but national or regional in nearly every case. With more interest and study being directed towards the world’s climate in recent years, there is a growing need for international data exchange for use by meteorological and oceanographic researchers. This required the creation of data banks at a coarser scale than in operational services. Within the WMO project, Global Digital Sea Ice Data Bank (GDSIDB), which started in 1989, historical sea-ice information for the major part of the 20th century was archived in electronic form due to collaborative efforts of several ice services, institutions and data centres (from Argentina, China, Canada, Denmark, Finland, Japan, the Russian Federation, Sweden and the USA). Presently, the GDSIDB has two archiving centres, located at the Arctic and Antarctic Research Institute, St Petersburg, Russian Federation (<http://wdc.aari.ru/>) and the National Snow and Ice Data Center, Boulder, USA (<http://nsidc.org/noaa/gdsidb>) and holds 7- or 10-day-period mapped ice data for the Arctic starting from March 1950 and for the Antarctic from January 1973 and to near the present for both regions. From 1970s GDSIDB ice charts may serve as a ground-truth to SSM/I products or be the unique source of data on ice conditions and climate for before 1978. During 2002–2003 the first blending technique for Northern Hemisphere GDSIDB charts was developed, with the final update developed in 2016, so that the resulting blended data set presently contains the greatest amount of ice data for 1930s–201Xs. The product is scheduled to be extended as new data become available.

IICWG jointly with ETSI contributed to the development of the Ice Logistics Portal (<http://ipy-ice-portal.com/>) as a joint initiative with the European Space Agency through the EarthWatch GMES Service Element PolarView in support of the IPY 2007/2008. This Portal provides a single interactive website to operational sea ice information from National Ice Services for regions in the northern and southern hemispheres. The Portal has been active since May 2007. It contributes to the Global Cryosphere Watch (GCW) and the MyOcean project, funded by the European Commission. In 2009-2010 the Ice Logistics Portal has been transferred from PolarView to the German Ice Service, Bundesamt fuer Seeschifffahrt und Hydrographie (BSH), <http://www.bsis-ice.de/IcePortal>, with two versions running in parallel mode at the current time.